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ENGINEERING + FINANCE + COMMERCE

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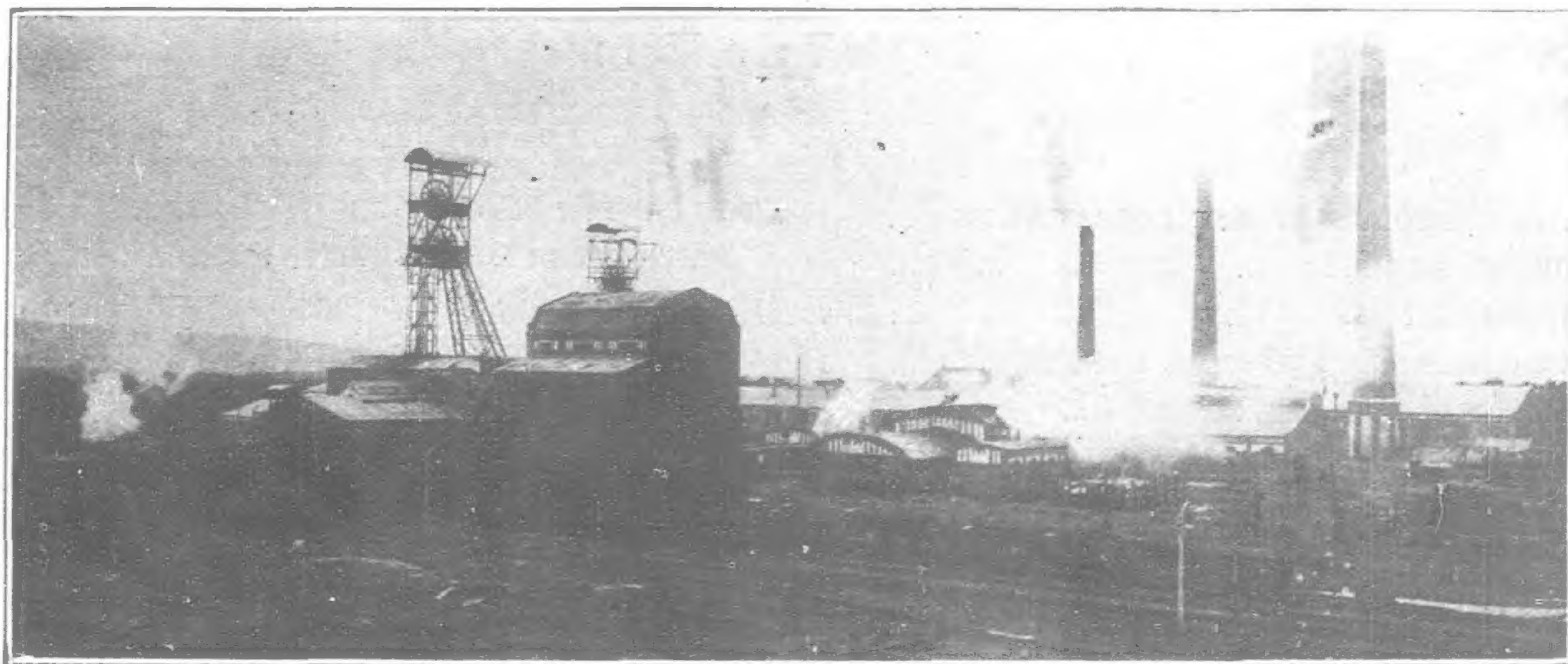
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SHANGHAI, PEKING, TOKYO AND MANILA

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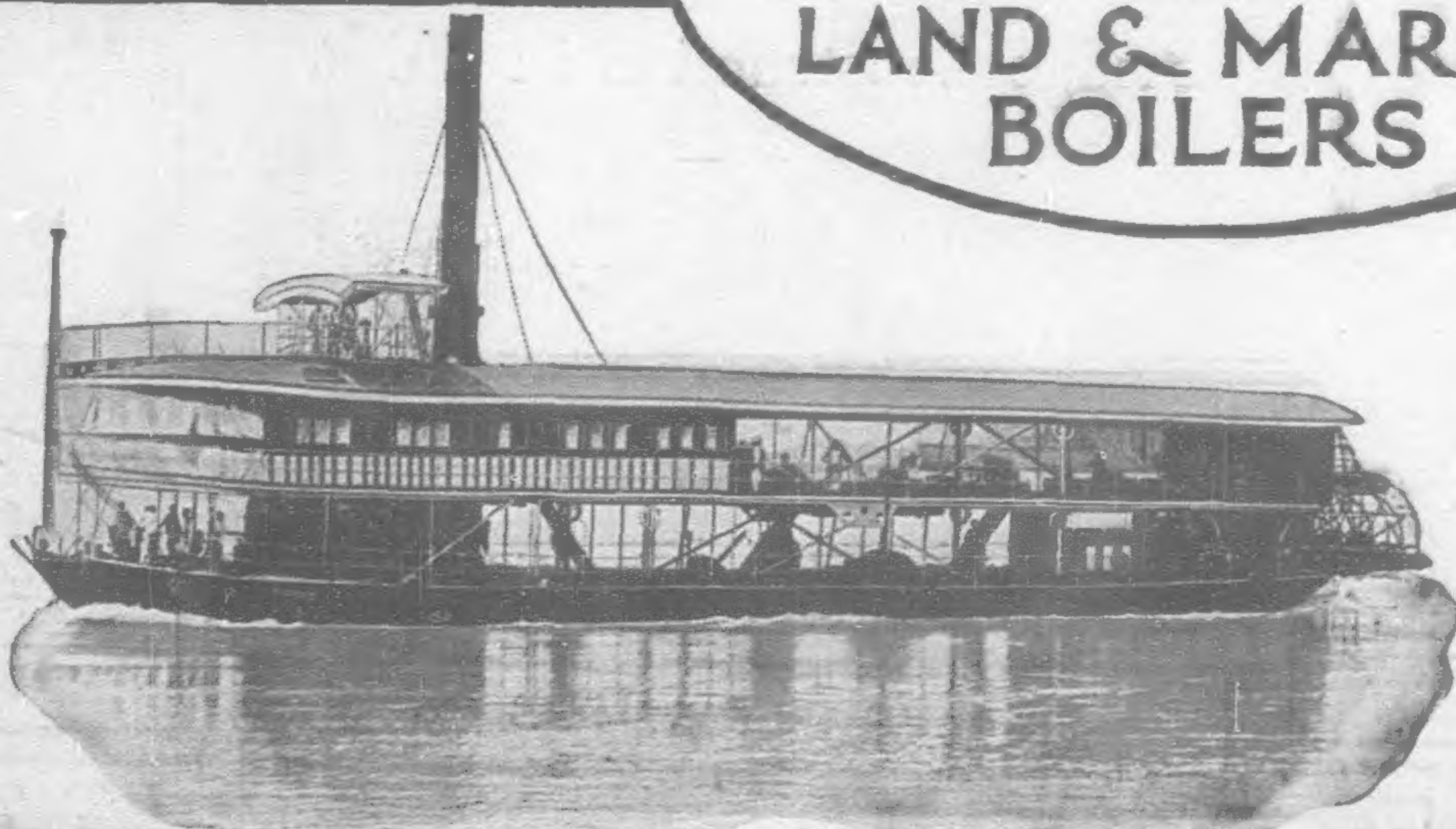
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The Far Eastern Review

ENGINEERING

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VOL. XIX

SHANGHAI, FEBRUARY, 1923

No. 2

Chaos, Civil War, Insolvency and Ingratitude

Dyer Sums Up The Facts

FOR the first time in many years a highly placed American official has discarded the language of diplomacy, dropped sentimental flub-dub and reported the facts as he found them in China to the American people. Congressman L. C. Dyer, the author of The China Trade Act, has been making a personal investigation into existing conditions in China in order to obtain first-hand information to enable him to secure legislation at Washington to support American business development in this country in connection with amendments considered advisable in the recently enacted bill providing for Federal incorporation for American business in China. Mr. Dyer is also the personal representative of President Harding commissioned to report directly to the head of the nation on general conditions in China.

Congressman Dyer represents a Missouri constituency. He insisted upon being shown and after having seen conditions at first hand and poring over contracts and other documents to be personally convinced of the truth of statements made to him, formed his conclusions without being coached by the usual propaganda committee directed by the Peking official intelligence bureau. In view of the seriousness of the present situation and in order that the facts should be made clear to President Harding and the American people, the American chamber of commerce at Shanghai most wisely determined that Congressman Dyer should be permitted to see things as they really exist. The result is seen in the following interview given out by Mr. Dyer in Peking on January 30:—

"In view of the importance of measures now under consideration in Washington, which are largely an outcome of the Washington conference, I will on my return to Washington, express my impressions and conclusions on present conditions in China. I refer amongst others to such outstanding questions as the commissions to be appointed to advise on customs increase and consideration of the judicial system of China with a view to possible future abolition of extraterritoriality.

"Information has also been sought from me touching the remission of the remaining Boxer indemnity funds aggregating between G.\$12,000,000 and G.\$13,000,000 in their application to purposes beneficial to the people of China.

"The broad desire of the American people is that in supporting these measures they shall produce benefits which will satisfy public opinion that the objects intended have been achieved in constructive results to China.

"The questions which I will be asked on my return to Washington are—

- 1.—What are conditions in China to-day?
- 2.—Are they establishing a stable government?
- 3.—Is the country now reasonably well administered and is progress being made in railroad construction and industrial development?

4.—Can it be considered safe to extend to China financial assistance to help build up her communications and industrial development?

5.—Are the Chinese sustaining their reputation for individual honesty in the management and administration of government public utilities?

6.—Are they meeting government obligations?

"I will for what I believe to be the good of China and America have to tell Washington that—

1.—I find China in a condition of chaos, with civil war south of the Yangtze; Szechuan in the west reported in turmoil and armed camps dominating all parts of North China.

2.—In Peking I have met individually brilliant men and idealists but, possibly due to military interference, no real evidence of broad constructive endeavor to achieve in government affairs a unity of purpose to bind China together as a nation.

3.—In China's relations to American business I find a lack of the spirit of reciprocity to respond to the goodwill which America extends to China.

4.—On the Yangtze, steamers under the American flag have been repeatedly fired on by Chinese troops and hampered in their business operations because of Chinese official and military obstruction.

5.—In many parts of China the lives of foreigners are endangered by uncontrolled soldiery and those in the guise of brigands, culminating in the recent deplorable incident at Kalgan where Chinese soldiers under Chinese officers murdered an American citizen.

6.—I find China insolvent due largely to the squandering of government funds in military adventures and the maintenance of demoralizing military forces. There appears to be a complete disregard for the obligations of China to American merchants and bankers.

7.—I find in Peking numerous representatives of American commercial and financial interests, maintained here merely for the purpose of endeavoring to collect debts owed in many cases for years by the Chinese government.

8.—I find on examination of some of the contracts that they were awarded by the Chinese government as a result of public tenders specifying final payment within a definite time after completion, delivery and acceptance of goods. Such are examples of the obligations the Chinese government has failed to meet.

9.—Aside from unpaid bills for materials, China has borrowed money from important and influential American banking interests. Some of these loans are in default both as to principal and interest—and have been in default for some time. Americans cannot understand what China is thinking of to permit those defaults so continue unremedied.

10.—On the question of extraterritoriality I have not observed any convincing evidence of the existence of a judicial system which

would warrant me in supporting in Washington any movement to abolish extraterritoriality thereby entrusting the lives and interests of Americans in China to Chinese administration of justice.

"I have frankly stated my impressions of China as I see conditions to-day. China has the real sympathy and friendship of the American people. Without thought of infringement of China's sovereign rights she can obtain, against adequate pledges, financial assistance to pay off existing obligations and take in hand needed reforms to carry on her industrial development.

"To accomplish this there must be a united China with a government which will command and hold authority as representative of the will and interests of the people of this great country.

It is my purpose in Washington to do everything in my power to further the attainment of support to China so that the trade relations between America and China may be developed to the greatest possible extent.

* * *

The Honor of the Flag

THE *liaison* between the waichiaopu and the American legation at Peking is a thing of the past. The wanton killing of an American citizen in the presence of an American consul at Kalgan awakened not only the government but public opinion at home to the danger involved in further pandering to a government which exists solely to conceal from and justify before the world the crimes of its real masters. In standing firmly for an apology, reparations and punishment to the guilty parties, the American government has recognized that unless such action is taken for the protection of American lives and properties, and proper respect for the flag and its representatives abroad, there is little hope of building up a foreign trade each year becoming more essential to the national prosperity. There was a time perhaps when the state department could pursue a policy of watchful waiting in the midst of a world upheaval while our citizens were massacred in Mexico; but times and conditions are different. Foreign markets are now important to our manufacturers, and unless our citizens have the fullest confidence that their government will stand by and protect them in the legitimate pursuit of business in foreign lands, the bottom will drop out of the campaign for foreign trade expansion and markets gained at the cost of much hard work handed over to competitors whose governments know how to protect them. The killing of Coltman at Kalgan and the insult to the representative of the American government by the rabble army of the *tuchun* of Charhar, automatically became a major case, upon whose outcome rested the future of American trade and respect for the flag in China. It is gratifying and inspiring to non-hyphenated Americans who have held aloof from entangling sentimental alliances to see how splendidly the legation and state department swung into action along those old traditional lines that marked American diplomacy for over a century, and which conveys to the world and to China in particular, that the leading strings which tied the waichiaopu to Washington have been cut. China stands upon her own bottom. She demanded this right at Paris and at Washington and it was conceded her. She has insulted and outraged the friend whose sympathy and support enabled her to attain her most cherished aspirations. The American attitude towards China now depends on the outcome of the Coltman case; either China complies in full with the American demands, or American policy towards this country will undergo a marked modification. Sentiment has gone by the board as far as America is concerned. For once our government is determined to insist upon the full acceptance of its demands.

These demands are listed under six heads: First, a general apology for the shooting of an American citizen in the presence of an American consul: (2) a full and complete apology from the *tuchun* of Chahar to be made formally to the American consul at Kalgan, embodying a letter dictated by the American legation; (3) dismissal of the three officers directly in command of the troops who fired the fatal shot (whose names are specifically pointed out

in the American note) and who are to be prohibited from holding office in the future, and furthermore tried according to Chinese law and punished in proportion to the amount of authority and responsibility exercised by them; (4) indemnity to the Coltman family; (5) an assurance that there will be no further interference with the right of American citizens to transport silver specie for legitimate business purposes; (6) the right is reserved to exact a further indemnity unless all the above provisions are complied with.

The above points have all been more or less accepted by the Chinese with the exception of the third demand. The American authorities insist upon the Chinese punishing these men according to their own laws, and it is upon this point that the Chinese are hanging fire. If the foreign office as the representative of the recognized Chinese government cannot guarantee or refuses to have these men punished, then the whole question of who constitutes the actual government of the country will arise.

The Chinese government has presented certain counter-claims asking that the American consul at Kalgan apologize for his part in the incident which led to the shooting of Mr. Coltman by the Chinese sentries, and for the punishment of Mr. Wooden, the companion of Mr. Coltman who had passed the barrier of sentries but later returned when he heard that Mr. Coltman had been shot. This counter-claim only helped to stiffen the American attitude and Secretary Hughes announced that unless they were withdrawn in *toto* and the American demands complied with, the United States government would be compelled to alter its attitude towards China. This decision was communicated to the waichiaopu. At the date of writing the American demands have not been met, and faced with the responsibility of having to settle this vital issue, the foreign-trained diplomats, whose success has been largely attained by reason of American sympathy and support, are hastily seeking cover.

There have been many comments on the Coltman case in the Chinese and foreign press in which an effort has been made to divert attention from the real issue and throw the blame for the affair on to the murdered man. However, the main fact is overlooked. The shooting of Mr. Coltman, although serious enough in itself, is secondary to the larger issue involved. Coltman was in the company and under the protection of the American consul at Kalgan the representative of his country who he relied upon for advice and safe conduct. If any infraction of the Chinese law was committed, the American consul alone was culpable, and the Chinese military commander should at once have made his charges through the usual diplomatic channels to the American minister at Peking. Had the Chinese case been a just one, present conditions would be reversed and the United States government placed in the position where it would have been necessary to apologize and dismiss its representative from the consular service.

Opening fire on the occupants of an automobile which included the American consul, and in which the latter escaped with his life by a miracle, elevated the crime from a simple murder of an American citizen to a deliberate insult to the American government, one which in other days would have admitted of no parley: it would called for an immediate apology, reparations or—hostilities. The American government has, therefore, no option in this matter. The dignity and honor of the flag is at stake. Coltman's death might have been passed over with an expression of regret and the payment of a suitable indemnity to his family: the insult to the flag and its representative must be met by China complying with the full demands made by the state department. In this the American government will not cede an inch. China will comply or suffer the consequences, whatever they may be.

* * *

The Death of Reinsch China's Ingratitude

THE collapse of the Sino-American "alliance" has been followed by the untimely death of the man whose influence and support made it possible. Dr. Paul S. Reinsch has passed away in Shanghai, following a long illness which sapped his vitality and

undermined his reason. Much of China's vaunted diplomatic successes at Paris, at Washington and in the conferences of the league are traceable directly to the guidance and support of the former American minister to Peking. The victories that have come to China at the conference table of the nations are due more to American championship of their cause than to any extraordinary abilities on the part of her official representatives. Reinsch made China's cause his own. He felt that he had been double-crossed by secret diplomacy when he dragged China into the war and gave her assurances of support at the peace conference that could not be carried out owing to the existence of secret understandings between the powers as to Japan's position in Shantung. The failure of China at Paris turned him against diplomacy as it is practiced. He resigned the post of American minister to China and accepted the position of counselor to China at Washington in order that he might undo the wrong unintentionally done when, through his influence, she severed relations with Germany.

Dr. Reinsch was not a professional diplomatist, and although actuated by the highest motives, his distorted view of America's mission in the Far East led him to start many things that he could not carry out, and it is no reflection on his memory to add that it will take years to undo some of the work initiated under his tenure of office as American minister to Peking. From the first he was impatient to do things, to accomplish something big that would redound to American prestige in China, and to his lack of accurate knowledge of international policies in China is due largely the failure of the Siems-Carey contracts, and the closing of the Chinese field to further independent American activities. The consortium that was created as a result of his initial failures was the only way out of a delicate situation that would permit Americans to participate in the development of China. It is to be regretted that Dr. Reinsch camouflaged the reasons which made this international financial combination necessary by throwing the blame upon Japan, for as noted elsewhere in this issue of THE FAR EASTERN REVIEW, there is no difference in principle between the much condemned Nishihara loans and the American loans to China made while he was representative of the American government at Peking.

Although he has been severely criticized for resigning the American diplomatic service to enter that of China, disregarding the recognized ethics of diplomacy in placing his knowledge at the disposition of another government at a time of intense international discord, yet he did his duty as he understood it. He felt that he got China into the mess by reason of his promises when she entered the war at his solicitation, and when his own chief at Paris surrendered to the other powers on the Shantung issue, he determined to contribute his efforts to undo the wrong he felt had been committed. It is superfluous to add that without the support and sympathy of Dr. Paul S. Reinsch the anti-Japanese movement in China could not have made headway. That other agitators and propagandists took advantage of the situation to push forward their schemes to incite hostilities between Japan and America was only natural, to the extent that even associate advisers to the Peking government drew up plans of campaign in preparation for hostilities.

The reputation of many champions of China have been built up and made possible simply because Dr. Reinsch with his great influence and power as the American minister made their propaganda work in America possible. He was the standard bearer, the leader whose advice and prestige with the American people enabled the rank and file of the anti-Japanese war element to operate and get their story over. Without Reinsch, China's case could never have been brought so forcibly home to the people of America, and without his support, the Chinese delegation to the Paris and Washington conferences would have had hard sledding. The laurels that have come to other champions of China's cause are theirs because they had at all times the inspiring counsel and aid of Dr. Paul S. Reinsch.

What was his reward? For over three years he carried the load for China in the United States. He became Chauvinistic

in his dreams for her greatness. Books, magazine and newspaper articles from his pen and many speeches kept American interest centered upon China and her real or fancied wrongs. He came to China last autumn in order to contribute on the ground his advice towards national unification and financial reform. He also came to collect his much overdue salary of \$20,000 gold a year. Reinsch was a poor man. When the Chinese failed to remit his salary, friends accepted his promissory notes in order to tide him over. He owed considerable sums to his intimates. He hoped to straighten out his financial difficulties in Peking. He failed. Discouraged and disheartened he left Peking facing financial dishonor. Never a strong man, he broke under the strain at Hankow on his way to Shanghai. Only after he was in the hospital and his life despaired of, did the Chinese government remember him. They sent him \$5,000 in cash, paid one of his notes for another \$5,000 and renewed his contract for another year, but not before other Chinese had solicited Americans in Shanghai to contribute towards a fund for his financial relief and to send him home with.

So died Paul S. Reinsch, abandoned by those he sacrificed his career to assist. It broke his heart, undermined his reason and sent him to an untimely grave. Reinsch died the victim of Chinese ingratitude. His passing was a real tragedy.

While he lay dying in the hospital, his employers in Peking who could not raise the salary that would probably have saved the reason and life of this American adviser to the government of China, found no difficulty in raising \$72,000 to finance a publicity and intelligence bureau directed by one British adviser to the president of China, and another \$150,000 to start a new newspaper and propaganda service directed by another British adviser to the president of China. The success of both these British directors of China's publicity and propaganda work in influencing American opinion is traceable also to the fact that it was Reinsch, the American minister and adviser to the Chinese government, whose prestige at home made it possible. Americans will not forget.

• • •

An Indiscreet Chronicle from the Pacific

By Putnam Weale, Dodd, Mead & Company, New York
(Contributed)

PROPAGANDA is the aim of this book, but after a careful reading of it, one is left in doubt as to whether the propaganda is directed toward a justification of the author, or toward furthering the interests of China. Mr. Simpson, who writes under the name of Putnam Weale, has frequently referred to himself as a publicist by which we suppose he means that he is a writer of topics of current or public interest. The only parts of this book which may be considered to be of current or public interest at the present time are those relating to Mr. Simpson and his connection with the Chinese government. On page 96 in his Memorandum to Lord Riddell, Mr. Simpson states in paragraph (1) "I have been sent to London by the Chinese government to make clear China's position, which does not seem to be at all understood in England." This view of his mission does not coincide with the statement made by the ministry of foreign affairs on July 18, 1921 in which it was said, "During this summer Mr. Simpson was entitled to a vacation, and taking advantage of this he proposed to visit both America and Europe, and asked what he could do for the Chinese government. He was therefore instructed to study and report on American and European opinion regarding China and its aspirations." To the ordinary mind there is a wide difference between reporting on American and European opinion regarding China, which were Mr. Simpson's official instructions, and making clear China's position, which was Mr. Simpson's self-appointed task. It thus turns out

that the present Chronicle is an apologia for the way in which Mr. Simpson attempted "to make clear China's position." As no official documents of the Chinese government are quoted, it is necessary further to note that the Chronicle is not a statement of "China's opinion," but rather an exposition of Mr. Simpson's personal views as to what China's position is. In estimating the value of this book one needs, therefore, to consider Mr. Simpson's point of view as to the duty of a writer on public topics to state the truth, the whole truth and nothing else but the truth.

At the outset we are met by a difficulty, for Mr. Simpson says on page 91 that "publication was what was needed—much publication—persistent publication." As to what should be published he also has a clear, though not convincing opinion on page 219. "Overstatement is good and refreshing in an atmosphere of compromise and indecision, presided over by the Golden Calf." Now it cannot be claimed on any score that overstatement is truth, and it is therefore probable that the term "indiscreet" used in the title of this book is synonymous with "overstated." The reliance of the author upon overstatement rather than upon truth is in marked contrast to Milton's dictum "whoever knew Truth put to the worse in a free and open encounter."

Propaganda and overstatement came to full fruition during the late European war. In England Lord Riddell was a brilliant example, and of him the author says that he made "such a remarkable success in Washington," that he "has Scottish sound common sense and can recognize new facts without being irremediably upset by them." There were also Northcliffe and Burnham, "that most genial of all men." In France there were Maurice Bunau-Varilla of the *Le Matin*, Arthur Meyer of the *Gaulois* and André Géraud (Pertinax), of the *Echo de Paris*. The United States had George Creel with his committee on public information, and Ray Stannard Baker, director of the press bureau of the American commission to negotiate peace at Paris. Japan had the *Kokusai* agency. These were all worthy masters of overstatement and all of them had small use for truth when it stood in opposition to the objects toward which they pressed. Mr. Simpson had a long line of distinguished war writers as a model for his Indiscreet Chronicle; the only pity is that he has not yet come to learn that the sober public opinion of the countries represented by these writers has for some time classified them as undesirables. Overstatement of some facts and suppression of others had currency during the war, but as soon as it was over the public of all countries ceased to be fooled.

The narrative is concerned with the events of the imperial conference at London and with the limitation of armament conference at Washington. One might imagine from this Chronicle that the only question before either of these conferences was the Anglo-Japanese alliance. No one but a prejudiced observer could come to such a conclusion. Sir Robert Borden of Canada stated the problems of this country in the memorandum quoted on page 44 as the way in which the problem of "a group of free democracies enjoying complete powers of self-government in domestic affairs" should be able to act "in close association with the mother country." This was the fundamental problem of the London conference. Ireland was another urgent problem. The Anglo-Japanese alliance held an inferior place, for its continuance in some form or other had already been agreed to by Canada and Australia before the conference assembled. The main problem before the Washington conference was the lessening of the burden of taxation, and it was recognized that the first step toward this end was a limitation of naval armament. This question in its turn brought up the problems of China, the mandated islands of the Pacific, Shantung, Siberia and Yap. Incidentally these problems brought up the bilateral Anglo-Japanese alliance for which was substituted a quadrilateral agreement. It is overstatement, and overstatement for a purpose, which allowed the author to place the Anglo-Japanese alliance in the centre of the stage at both conferences. It was present at both conferences, it is true, but always behind the scenes. The place of undue importance assigned to it by the author is the mental afterglow of the strong defense of China's rights

against Japanese aggression in which Mr. Simpson took a conspicuous and worthy part.

The Chronicle can lay no claim to dignity of thought or diction. "Indiscreet Letters" was a brilliant piece of writing; the Chronicle bears evidences of hasty dictation. Speaking of America on page 22 the metaphors of the author become hopelessly mixed when he says "She dreamed great *dreams* which ended in commonplace diplomatic *morasses* because she was never prepared to do more than throw out *ideas* which she allowed others to *stamp out* of existence." On page 137 is the phrase "in much the same mood she had been in July," and on page 138 "it gave British diplomacy a preponderance over France with Japan." These are not good specimens of an English style in which the author had been "trained with a rod of iron" as claimed in the prefatory Note. The use of "we" on page 37 and again on page 52 is careless, not to mention its presumption.

It might have been expected that the author being an Englishman would speak courteously of things American, but we do not find this to have been his method. Lowell once wrote an essay on "A Certain Condescension in Foreigners." Mr. Simpson is condescending. These are a few examples—"American foreign policy always tending to use England as its starting point." "The state department was still as flabby as a wet pancake." "The price paid by Americans for the nominal acceptance of their schemes is nearly always the surrender of their ideals through the legerdemain of diplomats." He is even more severe upon certain individual Americans,— "President Harding had badly mixed up unrelated questions." "American statesmen should at least have understood, etc." In the elders gathered together as her representatives, there was no trace of the generosity or ardour of youth." "Secretary Hughes standing still with his arms hanging loosely beside him disclosed imperfect knees and small feet—two dangerous characteristics in a man. They mean a proneness to the influence of others; a tendency to accept formulas without proper inquiry; an absence of true conviction." On page 141 he regrets "that Mr. Hughes was not a more conscientious statesman," and on page 147 that "a unique situation arose which, had it been understood by Mr. Hughes, would have been dealt with." On another page he says "easily influenced by others and with a weak department behind him which had never known how to utilize the great stacks of information which had been accumulated throughout the years, Secretary Hughes needed support and plainly showed it." Is it not a pity that Mr. Hughes, an American amateur, under such circumstances did not turn to the author himself an experienced Englishman, for on the following page he assures us that the Monroe Doctrine had been prepared in England and that "there must always be a Canning before there can be a Monroe." These are all indiscreet sayings, but they are also amusing.

The memorandum which Mr. Simpson prepared for Premier Meighen of Canada refers to "the defense of the gulf of Pechili scheme which is under consideration and is designed to protect the approaches to the capital (Peking), pending American mobilization. This document, which is strictly confidential, is annexed hereto." A search at the end of the memorandum does not disclose this document. It would furnish interesting reading, but was it in reality an American mobilization that was planned? It would seem to be something even more surprising for on page 135 we read of a rigid blockade of Japanese coasts by an "Anglo-American fleet." If the terrible rains in Japan could not silence the discussion of disarmament, was it the dryness of the air in Peking which put an end to the American mobilization scheme? Or was there ever any such a scheme except the one prepared by the author himself, and, perchance, suggested by him to the Chinese government which suppressed it?

Is this book really an "Indiscreet Chronicle" in the same way as "The Indiscretions of Lady Susan" were in reality discreet parts in dramas great and small all the world over; or was the author romancing as he did in "The Human Cobweb," or "Wang the Ninth"? We are at least certain that it is autobiographical. Perhaps herein lies the indiscretion.

Saving China

The Price that Must be Paid

BACK in 1895, a famous American war-correspondent stood by General Oshima at the taking of Ping-Yang and afterwards rode into Port Arthur with the troops of General Yamaji, witnessing at first hand the horrible atrocities committed upon the Japanese who fell into the hands of the Chinese and the terrible price exacted by the victors when they stormed the stronghold. In concluding his story of this campaign, "Jim" Creelman said: "it is most important to remember that the most decisive elements in the struggle were the presence of a passionate national sentiment on the one side, and the almost complete absence of patriotism on the other side. The Chinese were well armed, and were fighting on their own soil behind great fortresses equipped with every death-dealing device of modern military science. But they were devoid of that pride of country, that fierce love of national glory, which thrilled the Japanese soldiery. So far as the Chinese were concerned their flag represented a mere abstraction, a distant, invisible, almost unthinkable authority, having no direct relationship to the individual, and manifesting itself in an endless system of squeezing, through the doddering old mandarins and their brutal retainers. To die for such a flag seemed as foolish as the tears of Mark Twain at the grave of Adam. The proclamation of the Chinese emperor, issued at the most critical stage of the struggle, called upon the inhabitants of Manchuria to resist the invaders—not because their manhood and honor would be stained by the conquest of their soil, not because their homes were threatened, not because they were to be enslaved by a foreign government, but for the reason that the tombs of the emperor's ancestors at Mukden were in danger of desecration.

"To the Japanese soldier, the flag of Japan stood for his own honor. His patriotism was simply an extension of his personal pride. Deep in his heart was the feeling that he who served Japan best, served God and world best. It was that sentiment, that conviction, which developed the soldier's spirit . . . It may be that after the Chinese have learned to love China well enough to fight for her, they may love her enough to purge her of cruelty, and corruption, and idle scholastic vanity—love her well enough to want to see her honored among the nations for her humanity and usefulness."

There was another outspoken British newspaper correspondent in China at the time, who wrote a book entitled "The Peoples and Politics of the Far East." Concluding a chapter on China, written after he had interviewed Li Hung-chang Mr. Henry Norman declared that

"The truth is that like everything else in China, her offensive and defensive power is a sham. The offspring of corruption and bombast is inefficiency . . . And even Captain Lang, declared that when under arms, one-half of the Chinese army is made up of savages. A force made up half of coolies, torn from their homes, afraid of their weapons, clamoring for their pay, driven forward by the lash, punished by the headman's knife; and half of uncontrollable savages, defiers of their own officers, insulters of foreigners, plunderers of peasantry, torturers of prisoners, murderers of missionaries, outragers of women, mutilators of the dead, is not the kind of an army with which Englishmen should desire to stand shoulder to shoulder, and the sooner we learn to look for our Eastern alliance elsewhere than in China, the better."

With the exception that the emperor has been replaced by a puppet president, and the doddering old opium-smoking mandarins by the *tuchuns*, the picture painted by "Jim" Creelman and Henry Norman in 1895, remains same in 1923. A few foreign-educated students have come to the top, thrust into prominence by

the old crew of officials as a sop to European opinion, a few foreign "advisers" have become attached to the system in order to manufacture a so-called public opinion, but at bottom the Chinese nation, the countless millions of uneducated workers, like the ocean, are agitated only on the surface by the winds and storms of politics; underneath, the great depths remain unmoved. That great requisite to the growth of patriotism and public spirit is still lacking. Public opinion, as we understand it in the west, does not exist.

It is a far cry from "Jim" Creelman to Frederick W. Stevens, from 1895 to 1923, but after reading the remarkably able address delivered by the representative of the American group in the consortium before the Chinese social and political science association in Peking on December 8, last, on the subject of "Public Opinion as a Force in China," we are convinced that these careful observers have placed their finger on the real reason why China finds herself in her present unenviable position and why there is absolutely no hope for the nation, or the success of the republic, while such conditions continue to exist. A republic without a public opinion is a farce, a play on words intended solely to impress impressionable foreigners who look no further than the word itself. At the same time, the sober-minded criticism of the British writer on the conditions underlying the Chinese army and the *morale* of its troops, is as true to-day as when it was written. China has not changed, and to think that otherwise sensible Americans have been so blind to the facts as to seriously advocate standing shoulder to shoulder with the Chinese army as allies in a war with Japan, or have not resented the intrigues to bring this about, is enough to call for an examination into their sanity.

Mr. Stevens brought forcibly before his audience the urgent necessity for the creation of the means to being about a healthy public sentiment and arraigned the students for advocating an anti-Christian movement at a time when they should have been supporting Tung Kang in denouncing corruption in high office. In this Mr. Stevens, incidentally invites attention to that drift of so-called Chinese public opinion, which, under certain conditions, ignores the real root of their country's evils and attempts to throw dust in the eyes of the people by attacking the foreigner. Here was a typical example of the force and trend of public opinion in China. At a time when one of their highest officials, a man of education and character, with an excellent reputation as an honorable public servant, was courageously denouncing graft and corruption in high places, the students of Peking, instead of honestly trying to help their country by standing by this leader were organizing an anti-Christian movement!

Their country was faced with dissolution, foreign intervention, financial bankruptcy: there existed a thousand evils the students could have fought against, but they turned instead against the Christians! who at the cost of many millions Mr. Stevens reminded them, "are the founders of great colleges and universities in China, eagerly availed of by thousands of young Chinese; who are sending out to all the provinces well-educated Chinese physicians, surgeons, nurses, teachers and preachers; who are teaching the Chinese how to save their cotton and silk industries from extinction; how to develop agriculture! They turned against the Christians who at the cost of many millions have founded and are operating great and small hospitals throughout China!

If, as Mr. Stevens points out, this reflects the general attitude of the student movement, a long time will elapse before China will be saved by righteous and aggressive public opinion. "Mass meetings of students," he continues, "are called to help drive good-men out of office. Why should not mass meetings including more

mature men be called to help keep good men in ; to denounce the evils that have brought China low and are keeping her down " ?

Concluding, he brings home to his hearers the essential point, in the creation of a patriotic public opinion, by advising them **"not to start in this patriotic business until you have enough patience, persistency, and COURAGE, moral and physical, to carry you a long way, for it is a hard and long road you must travel. The task is becoming harder all the time. It will involve some, perhaps much, self-sacrifice. It will try your souls . . ."**

"Until there be many Chinese who are willing to risk their offices, their positions, their freedom, indeed their lives, in this cause, not much can be expected. The English history of freedom and good government includes the story of brave men, all willing to be martyrs and some of whom became such. The signers of the American declaration of independence knew when they signed it that unless there should be success, it meant the death warrant of every one of them. The history of the world shows that personal risk by patriotic and courageous citizens has always been the price paid for freedom, justice and good government ; and it must be paid in China before they will be achieved here."

"What shall it profit YOU if you gain personal safety and save your positions for a time,—and meantime your country rushes to the conditions of Taiping days ?

"Nothing great comes without sacrifice commensurate with its greatness."

Over the stretch of years the war-correspondent clasps hands with the practical lawyer and financier. Both come to the same conclusion. China will never be placed on her feet by any "Save the Nation and Weep Society," unless its members are prepared to change their tactics and substitute action for tears, unless they are willing to pay the price that all other nations of men have paid ungrudgingly for liberty, progress and good government. Love of country may be theatrically displayed in a popular boycott against foreign goods and this may be played up by the foreign publicity agents of the student movement as a sign of the awakening of a national spirit (there is little risk and much notoriety in such methods) but before China can shake off the shackles of mediaval feudalism, this movement must be turned inward ; the leaders must be prepared to sacrifice their lives for their principles : they must pay the price that all other red-blooded men have paid for their liberties. Unless graft and corruption are uprooted as part of the national conception of life, business and government, China will never take her real place in the comity of nations. If the Chinese were real militarists, good fighting men, they might, like the Turks, prolong indefinitely their national existence under any old kind of a corrupt government, and impose their terms upon the world.

But unless there is a love of country, or a religious fanaticism to inspire the people to lay down their lives for the preservation of their liberties or their faith, the day will arrive sooner or later, when China will go the way of all passive-resisters. The yoke of the conqueror will slip quietly over their necks and the glory that was China blotted from the pages of history. As in the case of Turkey, the jealousy of the powers may prevent any actual partition of Chinese territory for many years, but the yoke will be fastened on through foreign control of her finances, and like Egypt, the independence of China will become ancient history.

China is inviting such a fate by her refusal to recognize the consortium or ask it for relief. Once this international guarantee of her integrity is withdrawn and she drifts into bankruptcy through further impossible loans, the Chinese will pay for their lack of patriotism.

* * *

It would appear that the Chinese general chamber of commerce of Shanghai is now initiating a popular movement to demand the disbandment of troops which will take the form of a nationwide demonstration. It is proposed to hold processions in the chief cities sometime in March for the purpose of calling attention to the importance of the reform measures demanded, which include disbandment, unification, constitutional government and reform of national finances. As usual, however, this movement, like its

predecessors, will rely largely on the students, as we are informed that the principals of all middle and higher schools are to be approached in an effort to secure their co-operation, while shopkeepers are to be invited to close their doors during the day as an evidence of their sympathetic support of the movement. The students will do the parading and the shopkeepers will support them by suspending business.

In commenting on this movement at least one foreign newspaper has voiced the opinions expressed in the above editorial, pointing out that the leaders, with all their good intentions and advantages, were "good Chinese" and so "have no taste for being martyrs." Although we are in receipt of a contributed article which insists that the Chinese have shown a capacity for martyrdom, it is admitted that "the deepest root of China's present trouble is the fact that the overwhelming majority of her men in official positions have been, and are, devoid of true patriotism."

The writer is optimistic and expects that in the present crisis, perhaps in some respects the darkest hour in the history of China, there will arise leaders of unselfish devotion whose great privilege it will be to go down in history as the men who really saved their country. It is to be hoped that this will be the case, and while we heartily approve of any campaign that will tend to arouse the masses of China to a sense of their obligations to their country, even by student and other passive expressions of popular disapproval of existing conditions, we hold with Creelman and Stevens that if China is to be saved it will involve much self-sacrifice on the part of real patriots. Student parades coupled with boycotts and newspaper propaganda brings considerable notoriety and little personal risk to the leaders of such movements. It makes for cheap political fame, but in the end it gets nowhere. The price that has been paid in all parts of the world through all the ages for freedom, justice and good government will have to be paid in China; otherwise all history is a lie.

* * *

Chickens Come Home to Roost

THE Asiatic problem in the United States is shifting from the Pacific coast to the gulf states and reverting to its original anti-Chinese character. Although California still fulminates against the Japanese, the south and east are up in arms against the unlawful entrance of thousands of Chinese coolies smuggled into the country from nearby isles of the Caribbean. Attracted by the high wages offered by sugar planters, many thousands of Chinese have flocked to the island of Cuba, where after the crop season, confronted with six months of idleness and their pockets filled with money, they have naturally turned their eyes towards the Mecca of the Asiatic laborer and willingly paid the \$500 "fare" for landing them on some safe and secluded beach of the American coast line. Over 25,000 Chinese coolies are now in Cuba, waiting for the opportunity to slip into the promised land. The island of Jamaica has developed into a central distributing depôt for Chinese coolies desirous of entering the forbidden land by the "undersea" route. The south has become alarmed and the revenue forces of the United States are now concentrating their energies in an effort to put a stop to this traffic.

In our younger days it was considered great sport to run the gauntlet of United States revenue cutters and outwit the secret service men specially assigned to stop filibustering expeditions destined for the shores of Cuba from leaving the United States ports. Time and again the Spanish government protested against our lack of vigilance which constituted a breach of neutrality. Expedition after expedition was fitted out, slipped past the cordon and reached the high seas and the shores of Cuba in safety. In those days the successful violators of the law were popular heroes.

A quarter of a century rolls by. The shoe is now on the other foot. Versed in all the intricacies of the filibustering game, knowing intimately every safe landing place along the Florida and gulf coasts, the Cubans are now engaged in the lucrative business of unloading their superfluous Chinese coolies on our shores at \$500

per head. The old filibuster has simply reversed the game and provided the revenue service with an opportunity to prove that it is more efficient than it was in the early nineties. Confronted with a situation most difficult to deal with the American government has followed the lead of Spain and protested to the government of Cuba. As it was difficult to interfere with a most profitable and popular sport in 1897 when Americans were playing the game, so it may be difficult at this time when the tables are turned, and it comes to putting an end to a most profitable Cuban pastime. Chickens come home to roost, after all.

* * *

Some rather funny looking chicks are also chirping to climb on the perch of the Japanese hen-roost. The Chinese play no favorites when it comes to worming their way into lands where high wages are paid. Because of the great industrial prosperity of Japan and the continuance of war wages, and despite his propensity to boycott and belittle the Japanese, Ah Sin has no particular objection to having a try at fortune in the latter's country. So we find him quietly slipping into Japan in the guise of students and peddlers and taking up jobs as laborers and mechanics. In the

face of this influx, the Japanese are non-plussed. They are up against a proposition which puts to the test their definition of racial equality.

Several Japanese newspapers have invited attention to the large number of Chinese peddlers and laborers in and around Tokyo, and some time ago the police authorities discovered that a group of laborers had entered the country in the guise of umbrella dealers. In accordance with the imperial ordinance of December 1899 the authorities decided to deport all who had entered under false pretences. This step aroused the ire of the Chinese students in Tokyo and called forth a protest from Peking. The Japanese authorities were up a tree. After full explanations and with a desire to meet the Chinese fairly, the Japanese agreed that *bond-fide* merchants would be permitted to remain, and that those laborers who had been ordered deported but lacked the means to pay their passage, would be permitted to remain until they had earned the necessary amount to defray their passage. The affair was smoothed over, but the fundamental question remains unsettled. The Japanese bantam which crowed so bravely at Versailles has come back to roost a full grown game cock shooed home by their fellow Asiatics from across the China sea.

The Nishihara Loans

Japan's Contribution to the Allied Cause

By GEO. BRONSON REA

AS a result of the bitter anti-Japanese campaign of two years ago the world has been led to believe that all the so-called Nishihara loans to the Tuan Chi-jui cabinet are illegal, therefore to be repudiated. Constant harping on this subject by the official publicity agents of Peking has kept alive this erroneous impression and regrettable to record, many otherwise sensible Japanese writers have accepted the reports at their face value, thereby encouraging the Chinese to penalize their own financiers for what on analysis turn out to be most legitimate transactions. Eliminating the minor Japanese loans of the period 1917-19 and confining our remarks to those advanced to China by the three banks (Bank of Chosen, Bank of Taiwan and the Industrial Bank of Japan) we find the major transactions are as follows:

1. Jan. 20, 1917: loan for reorganization of the Bank of Communications	...	...	...	Y. 5,000,000
2. Sept. 28, 1918: supplementary loan for same purpose	...	...	...	20,000,000
3. June 18, 1918: Kirin-Hueining Railway loan advance	...	...	...	10,000,000
4. Sept. 28, 1918: War Participation Loan	...	...	...	20,000,000
5. " " " Manchurian and Mongolian Railway advance	...	...	...	20,000,000
6. " " " Shantung Railway Loan advance	...	...	...	20,000,000
Total	...	...	...	Y. 95,000,000

In commenting on this series of loans and in order to mislead the public, the fact that they embraced several distinct transactions, is invariably overlooked or wilfully ignored, the lump sum being stated with no attempt to differentiate between them. From the mass of hostile criticism appearing in Far Eastern and home papers on the Nishihara loans, the following extract from an editorial in the *Peking Daily News* of November 25, last, the official organ of the Chinese government, is selected as the most typical.

"In no case is it truer that one reaps what he sows than in the case of Japanese loans to China. A few years ago, Japan lent money to China recklessly and she now realizes that reckless lending, like reckless borrowing, is not a profitable proposition.

"It may be recalled that in 1918 and 1919, when Marshal Tuan Chi-jui was at the helm of the state and when the country was in serious political chaos, Japan made a string of loans to Chinese politicians under various pretenses. These loans were approved and supported by the Japanese cabinet, of which Count Terauchi was then the presiding officer. They were negotiated either in Peking or in Tokyo, but mostly in Peking, by Mr. Nishihara, the representative of Premier Terauchi and a number of Japanese banks in which he had a controlling interest. The loans have henceforth been known as "Nishihara loans." Their exact total has never been known. According to the published contracts, the total amount of all the Nishihara loans is no less than Y.200,000,000. Though supported and approved by the Japanese government, the loans are all unsecured.

"Practically all the Nishihara loans were contracted at the time under the most plausible pretext of industrial development of one form or another. But, it is very curious to say, none of the industrial enterprises for which the loans were contracted have every been started. No one exactly knows what has become of the proceeds of the different loans. Some say that they went to finance the political struggle then raging; others assert that much of the fund was wasted on soldiery; and still a third group of people seem to think that the money—a large portion of it, if not the whole—was used to finance the military campaigns against the Canton government, which had been established under Dr. Sun Yat-sen's leadership after the dissolution of the parliament in Peking in August, 1918. The truth is that a fairly large portion of the proceeds of the Nishihara loans remains intact, in most of the foreign banks in China, not however, under the name of the Chinese government, but on the credit or deposit account of those who had a hand in the negotiation of these loans and in their dispensation. Speaking plainly, a large portion of the proceeds went into the pockets of those officials who had the courage of contracting these loans without, in many instances, the knowledge of the cabinet. It is, therefore, a comparatively easy question to answer; what has become of the money from the Nishihara loans? The answer is that the money is now safely deposited in foreign banks for interest.

"This is the Chinese side of the transaction in which the Chinese government is the loser, of course. The gainers are those who are now drawing monthly or yearly interests from their deposits."

In apologizing for China's repudiation of these loans, the official organ says:

"These Japanese banks, which had money to overflow four years ago, are now finding themselves in deep straits, due to the failure of the Chinese government to repay the principal or interest on the Nishihara loans. From this financial stringency, the Japanese banks and the Japanese government as well should learn a sound lesson, that it does not pay to fish in troubled waters and that it is a bad financial policy to lend money recklessly and without security. Practically all of the Nishihara loans, though made under pretext of industrial development, were political loans. They were

contracted by the Peking military clique then in power for political purpose, and they were agreed to by the Japanese banks also for political purpose. The Japanese will, therefore, have none but themselves to blame to have ever made these loans at all."

It is well to pause right here and digest the words of wisdom expounded by the official organ, as they apply with equal force to all foreign lenders of money to China. The warning is of special importance at this juncture owing (as pointed out in another article in this issue of the FAR EASTERN REVIEW) to the difference of opinion between the American commercial attache and the representative of the American group as to the necessity of adequate guarantees for any new loan. The Chinese official organ very gravely admonishes the Japanese that it is bad financial policy to lend money recklessly and without security. It is. The representative of the American banking group has apparently taken this wholesome advice to heart.

The *Peking Daily News* is correct when it says that the situation of the three Japanese banks is most painful. They are now reported to be crippled as the result of the failure of the Chinese government to meet its obligations. This seems to afford considerable enjoyment to the Chinese official mouthpiece, providing the opportunity to read the Japanese a curtain lecture on their carelessness in not exacting adequate guarantees for repayment. Although the Chinese government has paid neither principal or interest on these loans, the 7½ per cent. interest has been religiously paid to the bondholders on due dates by the three banks, which means, that in five years they have protected their clients and maintained the credit of a defaulting government by paying out of their own surplus something like Y.7,500,000 yearly, or to date, about Y.40,000,000, which, added to the principal, makes a total out-of-pocket loss of about Y.140,000,000. Contrast this faith in China's integrity with the attitude of other foreign banks which, on the first default of interest on much smaller loans, failed to protect their clients, and injured her credit. No matter how much the Japanese loans may be open to criticism, the fact that the three banks protected their clients and the credit of China until they were financially embarrassed by carrying the load, will everlastingly redound to their prestige.

In order to raise the money for these loans, the Industrial Bank of Japan issued and placed on the market a series of "Industrial Bonds" to the extent of Y.100,000,000 guaranteed as to principal and interest by the Imperial government. Some of these bonds mature in May of this year and the balance in May of 1924, and the Japanese government is now confronted with the necessity of retiring the first issue by allocating funds from the treasury for this purpose, or of renewing the bonds for another term of years with government guarantees. The position of the three banks is such that another payment of the annual interest of Y.7,500,000 out of their reserve funds is a most serious matter, so the government is called upon to pay the next installment and include the sum in the annual or supplementary budget as an advance against the time when the Chinese government will consent to recognize and pay its obligations. The responsibility for repayment is thus squarely put up to the Japanese government and as the matter must go before the Diet for approval, it is certain to provoke considerable discussion, in which the government will be attacked by the opposition for forcing the official monetary organs under its control to take such risks.

In the midst of the bitter anti-Japanese campaign in China, it was only natural that Japan's every move should be condemned. Privileges exercised by other powers in their relations with each other could not be extended to Japan in dealing with China. Japan could do no right. She was to have been pilloried before the world and public opinion turned against her as it was against Germany in order to pave the way for the war in which it was hoped she would be crushed and eliminated as a factor in world affairs. The Nishihara loans were seized upon at the height of the hysteria as irrefutable proof of Japan's sinister designs upon China. The transactions were characterized as iniquitous, a bare-faced attempt to corrupt and bring the Chinese government

under the domination of Japan. To such an extent were these loans magnified and their objects distorted that they were used as justification for the organization of a new international consortium to save China from the clutches of Japan. China's parliament was not in session: the loans were concluded in secret (like all other Chinese loans) the money was not expended for any productive purpose, and altogether it was piously agreed by the smug hypocrites heading the anti-Japanese campaign, they were so rotten that the new clique of grafters who followed Tuan Chi-jui into power, need not recognize them. Repudiation, it was openly declared, was justifiable, and notwithstanding all honorable efforts on the part of the Japanese bankers to induce the Chinese government to meet its obligations, not one sen of interest has been paid to date. The three banks have carried the load of preserving China's credit in Japan. When pressed to meet the interest payments, the Chinese minister of foreign affairs very gravely wagged his head and declared that inasmuch as parliament had failed to sanction the loans, that the proceeds were not expended as provided for in the agreement, the present government of China could not possibly recognize them as legitimate obligations. They were repudiated.

Now the repudiator in this instance, happened to be the minister of foreign affairs who as Chinese minister to Washington signed on behalf of his government, the Lee, Higginson and Chicago Bank Loans, His Excellency Dr. V. K. Wellington Koo. These loans will bear a little scrutiny. The Lee, Higginson agreement of April 7, 1916 provided at the outset that the banking concern would be appointed fiscal agents of the Chinese government, that is, all future loans would be placed through their agency. After a year of negotiation, it was agreed that the fiscal agents would advance \$5,000,000 to the Chinese government on six per cent. three-year treasury notes at 93. There was no security other than the good faith and general revenues of the Chinese government and the loan was not earmarked for any specific purpose. On its face it was an out and out administration loan, a present from American investors to the moribund Yuan Shih-kai government. It is a fact that only \$1,000,000 was actually paid over, as before the expiration of the fortnight in which the balance (\$4,000,000) was to have been paid, the revolution against Yuan's restoration of the monarchy became so wide-spread that Minister Reisch became alarmed and stopped further payments. Had Yuan triumphed, there is little doubt that further installments would have been negotiated with the fiscal agents of the Chinese government on the same basis, that is, without security without sanction of parliament and for purely administrative purposes; donations to the military clique then dominating the government.

When it became apparent that Lee, Higginson & Company could not live up to the financial expectations of the new group in power at Peking, Dr. Koo hunted around in the United States until he found another donor. In the Chicago bank loan signed by Dr. Koo on behalf of his government on November 16, 1916, the former paid over \$5,000,000 as the first installment on \$25,000,000, in exchange for six per cent. three-year treasury notes secured on the wine and tobacco taxes. The object of the loan, and this is most important, was industrial development, the strengthening of the reserves of the Bank of China and the Bank of Communications and other similar objects. The last is very indefinite. Now the question arises, was this loan expended for the above purposes? It is only necessary to state that the governor of the Bank of China has officially gone on record that not one cent of the proceeds of this loan was paid into his bank. There is no record that any industrial enterprise was benefitted, nor was it ever sanctioned by parliament. It was, therefore, an out and out donation to the government of China without any guarantee that it would even be employed for the purposes specified in the agreement. In view of these facts, it would seem that Dr. V. K. Wellington Koo is the last official in China who has the right on behalf of his government to question the validity of the Japanese loans. If the latter are illegal, so is the Chicago loan. If the Chicago loan is legal and a just obligation of the Chinese people, then the Japanese three banks loan must also be liquidated.

In regard to the Pacific Development loan, we have not the agreement before us, but from all reliable accounts this also was an out and out donation of \$5,000,000 to the military clique then in power at Peking, advanced without security and for no particular purpose. Neither was this loan sanctioned by parliament. In principle it stands on a par with the Chicago and some of the Japanese loans. Although this loan has also been defaulted as to payment of interest, we have never heard of its validity being placed in question. If, therefore, the Chinese people acknowledge this as a legitimate obligation, the Nishihara loans by comparison are gilt edged.

Let us now examine the more important Nishihara loans negotiated through the three banks. The first of the series signed on January 20, 1917 was for Y.5,000,000 at 7½ per cent. advanced for the express purpose of reorganizing the business of the Bank of Communications, a semi-official institution. The notes were secured by (1) \$1,300,000 face value Lung-Hai Railway bonds (2) treasury bonds of the Chinese government to the face value of \$4,000,000 and (3) loan bonds to the face value of \$2,425,687 issued to the Bank of China. On September 28, 1917, a supplementary loan agreement was entered into for Y.20,000,000 at 7½ per cent. for the same purpose, the security being treasury certificates of the Republic of China to the face value of \$25,000,000. Here we have two of the much condemned Nishihara loans to the value of Y.25,000,000 adequately secured and advanced for the identical purpose as the much lauded and strictly legitimate Chicago loan. If a loan by the latter intended to strengthen the reserves of the Bank of China is considered legitimate in the face of irrefutable evidence that the Bank of China failed to receive one cent of the proceeds, then the three banks loan for strengthening the Bank of Communications must also be legitimate.

Let us now turn to the preliminary Kirin-Hueining Railway loan agreement of June 18, 1918, in which the three banks agreed to provide the funds for construction after the cost had been determined by the Chinese government. Construction was to commence as soon as the final agreement was signed. The loan was to be secured upon the physical property and revenues of the line after construction and bear interest at five per cent. An advance of Y.10,000,000 was paid to the Chinese government on the signing of the preliminary contract which in turn was secured by treasury notes to that amount bearing interest at 7½ per cent. In the same category comes the other two railway loans signed on September 28, 1918.

It is around these three loans that the bitterest campaign has been waged, in which the three banks advanced a total of Y.50,000,000 to the Chinese government in order to consolidate Japan's strategic position in Manchuria *vis-à-vis* Russia and make certain of retaining the German rights to the two railway extensions in Shantung. In regard to the Manchurian lines, subsequent disclosures of secret diplomacy have fully justified Japan's anxiety to protect her strategic position in these regions and in paying any advance, no matter how large, in order to insure the construction of lines that sooner or later must become of supreme importance for the mutual defense of both China and Japan against the menace from the direction of Urga. Whether Japan was justified or not in paying over an advance of Y.30,000,000 to China to establish her right to build these lines, is purely a question that Japan alone is entitled to answer. Japan is the best judge of her own vital problems. In our opinion, at a time of great international stress and uncertainty as to the outcome of events in Russia, she could have well afforded to have advanced a still larger amount in order to obtain these guarantees for her national security. Japan dealt with the recognized government of China and paid its price without haggling. Although other nationals in China may not have approved of Japan's tactics, we submit they were every bit as honorable and much more commendable than methods employed at other times by other powers in obtaining railway rights in China, which in their opinion were also essential to their strategic security. It is needless to go further into details to elucidate this question. All

intelligent students of the Far Eastern problem will recognize the truth of this statement.

As to whether it is more honorable to pay an advance or bargain money to the Chinese government in exchange for certain railway rights or extract the latter under severe diplomatic pressure, through secret bargaining or an impossible contract that can never be executed, is a matter that would call for much unnecessary and acrimonious discussion, and a minute examination of the preliminary negotiations surrounding all of China's railway contracts. Our own experience inclines us to the belief that a sum of money paid over at the time of signing a preliminary railway agreement, the larger the better, is the surest sign of good faith that the lines will be speedily constructed and not kept in cold storage and the agreements dragged out every now and then to establish a prior right and block any one else from developing the country. The mere fact that the Japanese government through the three banks, advanced without hesitation the Y.10,000,000 on the Kirin-Hueining preliminary contract, Y.20,000,000 on the Taonan-Jehol and other short Manchurian lines and Y.20,000,000 on the Shantung extensions would indicate an intention to proceed immediately to the construction of these lines, which after all, would have been Chinese government railways, built from the proceeds of a Japanese loan and operated for the benefit of the people of China, no different from any of the other foreign railway concessions. As indicated further on, the exigencies of the military situation demanded that the Manchurian lines be built as rapidly as possible, and they would have been built by this time had not foreign propaganda and wilful misrepresentation of Japan's intentions provoked the pooling of these highly necessary strategic lines in the consortium.

If it is honorable and legitimate to pay over bargain money to the Chinese government at the signing of a preliminary railway agreement as a sign of good faith and as an advance on the loan, to be employed for preliminary expenses, surveys, organization and salaries of head office staff, etc., then the difference between the three bank transactions and those of other foreign banks is merely one of the size of the advance. The principle remains the same. In the matter of the three banks advances on these railway agreements, however, it was distinctly understood that pending the signing of the formal or final working agreement, the advances would be secured by treasury notes bearing interest at 7½ per cent. In this respect the advance was in the nature of a loan without specific revenues allocated as security, in exactly the same category as the Lee, Higginson loan. The real security was the good faith and general revenues of the Chinese government. No critic has ever raised the question of the legality of the advance made by Mr. W. F. Carey on signing the preliminary railway agreement of May, 1916. It may have been expended in legitimate preliminary expenses or it may have gone into the pockets of certain officials. As far as Mr. Carey was concerned it was an advance on the main loan, and secured by treasury notes.

The legality of the Manchurian Railway loans to a large extent is determined by the legitimacy of the war participation pact and the subsequent loan for carrying into effect its provisions. The military and naval agreements signed on May 16, 1918 had for their specific object co-operation between the armed forces of China and Japan to combat the gradual extension of enemy influence towards the east jeopardizing the peace of the two countries and to drive out of the Amur and Trans-Baikal regions German and Austrian forces. Commenting on these agreements, McMurray says in his introductory note: "It need scarcely be said that both agreements contain no such stipulations whatever as will go towards disturbing the peace of China or encroaching upon her sovereignty, as has been understood to be the case in a section of the Chinese public. It must be clear from the agreements that they have been made entirely for the purpose of Japan and China participating in the allied operations, of facilitating defensive measures against the enemy, and of taking the steps to meet the urgent exigencies of the situation."

There is nothing clearer or more impartial than the evidence of this eminent authority.

That these military agreements were absolutely essential and bear testimony to the far-sighted grasp on the trend of the war by Japan's soldier-diplomat (Count Terauchi) is attested to by the fact that three months later (August, 1918) the American government announced its decision to send troops to Siberia to operate in conjunction with Japan for the identic reasons set forth in the war participation pact between China and Japan. There is furthermore sufficient evidence in published state documents (see Russian American Relations) that Japan's determination to defend herself and China against the spread of enemy activities in Siberia was fully endorsed by the American government and further, that the latter was quite satisfied to entrust the defense of allied interests in these regions to Japan alone. It was the incessant nagging and propaganda against Japan emanating from Peking and Petrograd which finally influenced Washington to participate in the adventure. In concluding his explanation to the Senate of the reasons why American troops had been sent to Siberia, President Wilson said "*this participation was obviously of incalculable value to the allied cause.*" If this be so, then the initiative of Japan and China in entering into a military pact for the same reasons three months before America moved, and which forced our hand, must also have been of incalculable value to the allied cause. If America was justified in sending her troops into Siberia, then the credit for this move of incalculable strategic value belongs to the soldier-statesman who directed the Japanese government at the time. Of course, it was very wrong for Japan to have a military premier during a world war, when all her allies were ruled by a political party autocrat. It placed her in the same class with Germany, yet as we look back over the history of the war, we incline to the belief that it would have been brought to a quicker end with less loss of life and expenditure of treasure, had some of the liberal governments been dominated by a military autocrat whose one idea was to win the war rather than by politicians more concerned in winning the next elections. The fact that Terauchi the military premier of Japan, initiated the move that caused all the allies to fall in line for the defense of their interests in Asia is something we have to be thankful for, according to President Wilson.

The so-called war participation loan of September 28, 1918, amounting to Y.20,000,000 was advanced to China by the three banks to provide funds to organize a defense army so as to be able to fulfill its co-operative duties and for the expenses of participation in the war. It was for the term of one year and bore interest at seven per cent. It was made payable to the chief of the treasury of the Chinese national defense army and the Chinese government pledged itself to reform its tax system in the future and the revenues derived therefrom reserved as the sources of a fund for the redemption of the loan. In other words, it was a loan made under the exigencies of the military situation to prepare China to fulfill her obligations as an ally, and at a time when the question of security could not be haggled over. It was for a definite purpose, in the same category as the many advances made by England to her allies and by the United States to her associates for the same purpose. Insistence upon adequate security or guarantees that the funds would be expended for the purposes they were lent at such a time of world stress was obviously out of the question, whether in transactions between England and her allies, the United States and her associates, or between Japan and her immediate ally. Guarantees and securities for military loans under such conditions would have defeated their object and permitted Germany to win the war. There were many American loans made to allied countries that could never be accounted for and there are instances on record where some of the advances were expended on objects that had no relation to the war. If reports are true, it would be difficult to account for one of the American loans to the Kerensky government expended largely in New York city along the Great White Way.

Once the necessity of this much condemned war participation pact is established and justified it follows without discussion that the loan advanced to China by Japan for carrying out its provisions

was also justified and of incalculable benefit to the allied cause. In connection with this loan is the contract with the Tahei Gumei of January, 1918, in which the Chinese government was to purchase arms and munitions of war to the value of Y.30,000,000 and in which it was distinctly specified that the Chinese government should not use these arms for the purposes of civil strife. If the war participation pact was justified, the loan agreement and the arms contract to enable China to carry out her obligations were most legitimate and from the allied point of view of immense benefit to their cause.

In order to justify repudiation it is alleged that instead of being employed for the purposes of the pact the forces equipped through the loan were used in crushing the rebellion in the south. This may appear to be a most satisfactory argument for the southern element to advance, but it does not invalidate the transaction. It certainly lacks force when advanced by the Peking government. The Peking government was the one recognized by the powers. The Peking government had severed relations and declared war upon Germany over the protests of the southern leaders. As far as the allies were concerned (and that means Japan) the south was pro-German and for all intents and purposes an open enemy. The menace to China, to Japan and to allied interests was in the far north of China and aside altogether from the fact that the Peking government was one of the allies, it was the only constituted and recognized one which could equip an army and co-operate effectively with the allies for the protection of their mutual interests in Siberia and Manchuria.

All honorable Japanese will concede that it was most regrettable to find that the Peking government abused the confidence of the allies and violated its agreements with Japan by employing a portion of the funds to solidify its power fighting the rebellion in the south. But in any case, even admitting that any portion of the Japanese funds was so employed, the fact remains that the world was at war. China, through her recognized government at Peking, was one of the allies. China could not fulfill her war obligations without financial assistance or if one section of the country was in revolution and in sympathy with the common enemy. The internal political disturbances in China were of no concern to Japan or the other allies when larger questions menaced the success of their cause on her northern frontiers. They were in duty bound to stand by and support materially and morally that element in China which espoused their cause. That element was in the north, represented by the recognized government at Peking. It was not in the south.

Now against the flimsy argument put forward to justify repudiation of these loans because they were employed to finance military campaigns against the Canton government, let us revert to the testimony of the *Peking Daily News*, the official Chinese government organ. The chairman of the board of this publication who directs its policy is in close and constant touch with the wai-chiaopu, its confidential adviser on all publicity matters and an adviser to the president of China. The official organ of the Chinese government says:

"The truth is that a fairly large portion of the proceeds of the Nishihara loans remains intact, in most of the foreign banks in China, not, however, under the name of the Chinese government, but on the credit or deposit account of those who had a hand in the negotiation of these loans and in their dispensation. Speaking plainly, a large portion of the proceeds went into the pockets of those officials who had the courage of contracting these loans without, in many instances, the knowledge of the Cabinet. It is, therefore, a comparatively easy question to answer; what has become of the money from the Nishihara loans? The answer is that the money is now safely deposited in foreign banks for interest."

Let us accept that statement. It takes the bottom out of the argument that the funds were used to fight the south with and places the responsibility for their repayment squarely up to the Chinese government and people. If that is true, why are these men not prosecuted and compelled to disgorge? Why have not steps been taken to convict these criminals? If this statement is true, then the governments under whose charter the foreign banks operate in China would certainly consent to having these stolen funds handed over to their rightful owner, the Chinese government. As it is difficult to imagine that these funds would be deposited in

a Japanese bank after the loans being repudiated, the facts as disclosed by the *Peking Daily News*, would seem to place this matter squarely up to the other foreign banks operating in China, and their governments. The Chinese official organ says in effect that the foreign banks in China are receivers of stolen goods, a very grave accusation.

The names of these officials concerned in the Japanese loan negotiations are no secret, neither should it be difficult to trace the names under which the deposits are held in the foreign banks. It is a rather large sum of money to conceal effectively. Admittedly, the Chinese received the money and hastened to place it in safe places outside the jurisdiction of their government, secure from confiscation. The Japanese lenders, however, received nothing but a worthless piece of paper in return. They were simply fleeced at a time of great international stress by a gang of official confidence men who took their money for specific purposes, failed to live up to their agreements and their successors in office who were not in on the graft repudiated the transactions. And although the bulk of the money so stolen is still reposing quietly in foreign banks drawing interest (which is probably being divided with the new gang in power) the Japanese lenders have disbursed Y.40,000,000 to date to sustain the credit of China and protect their clients! If the Chinese have their way, they will repudiate altogether these loans most honorably contracted without any attempt to bring the corrupt officials to the bar of justice or take steps to have the sums recovered and returned to the treasury where at least a portion of the amounts can be returned to the Japanese donors.

On the part of Japan, these loans were eminently urgent and justified by the exigencies of the military situation. Terauchi acted wisely and well from the standpoint of a power called upon to protect itself by bolstering up an impecunious neighbor and ally whose weakness and unpreparedness constituted a menace to the very existence of the empire entrusted to his care to defend. The series of above mentioned three bank loans stand on a par with the obligations of other allied nations to America and Great Britain. Japan advanced the sums demanded by the Chinese for certain railway concessions. Through the jealousy of the powers, she was afterwards denied the right to enjoy these concessions and coerced into surrendering them to the consortium. In taking over the Manchurian, Mongolian and Shantung lines with their advances of Y.40,000,000 the powers are morally obligated to support Japan in demanding that the interest and principal on these advances be paid. Otherwise, after depriving her of the exclusive enjoyment of the concessions by forcing their inclusion into the consortium pool, they are simply aiding and abetting China in repudiating her just obligations.

If the Japanese loans are repudiated on the flimsy pretexts set forth by the present Peking government and no attempt made to compel the former corrupt officials to disgorge, while American and other loans which are in the same category as the Nishihara transactions are recognized and paid, a great wrong will be committed. The three Japanese official banks faithfully discharged their obligations to their government at its express invitation. They could not refuse any more than any patriotic American or British bank would have refused a similar invitation to assist its government during the progress of a great war. In supporting their government to finance the war participation pact and make Sino-Japanese military co-operation possible, they were rendering a great service to the allied cause, a service that all other nations shirked after China had been prodded into declaring war against Germany. Had enemy influence in Siberia spread and the peace of China and Japan menaced in Manchuria, the construction of the Taonan-Jehol, Kirin-Hueining and the other Manchuria lines would have automatically become an immediate strategical necessity. There was no time to lose, and the situation permitted of no haggling or long drawn out negotiations. When viewed from this angle, Terauchi demonstrated that his knowledge of the Asiatic military situation was on a par with Foch's grasp of the problem on the Western front. Because a few rabid anti-Japanese foreign diplo-

mats and propagandists playing to the Chinese gallery started a violent campaign to discredit Japan, the world accepted their viewpoint and Field Marshal Count Terauchi was held up to scorn and his motives impugned because he had the foresight to see ahead and prepare against all emergencies in the part of the world entrusted by the allies to his defense.

It is not our intention to analyze all the Nishihara loans at this time. Our immediate purpose is to throw light on the legitimate transactions of the three banks which acted merely as the agents of their government to forward its plans for the successful prosecution of the war in territories of an ally utterly incompetent to defend its own interests, and by reason of its insolvency and military weakness a grave menace to the success of the allied cause. The transactions of the three banks in the matter of the Manchurian and Mongolian railways and the war participation loan are as much a part of world war finance for the good of the common allied cause as any of the American loans to Europe, obligations that although difficult perhaps to meet at the present moment, are held by all parties concerned as sacred. The obligations of China to Japan are of special importance from the fact that after practically forcing China to declare war against Germany, she was refused financial assistance by the United States in order to enable her to fulfill her part in the struggle. The time arrived when conditions in Siberia demanded prompt action, and when America declined to advance the funds, Japan stepped into the breach, and took over the burden. In lending money to China at a time when other powers could not or would not advance the funds, Japan acted in self-defense, and incidentally furthered the cause of the allies. The mere fact that Japan was lending money to China when all others could not, seemed to indicate an intention on her part to dominate the country. The others turned on her.

There may have been, as alleged, fifty thousand ulterior motives in the mind of Terauchi when he ordered the official Japanese banks to carry out his instructions, but the great fact will remain that his action was most praiseworthy and when viewed from a proper angle in relation to world events and Japan's duty in Asia, of incalculable value to the allied cause, and of supreme vital importance to the safety of Japan and China, which after all, was Terauchi's first concern.

Any formal announcement on the part of the Chinese government that these loans are illegal and are to be repudiated because of non-approval of parliament, failure to exact guarantees or to supervise the expenditures, must of a necessity strike at the legitimacy of all her foreign loans of the republican period, many of which, by comparison, are in the same category. The principle underlying the negotiation of the American and Japanese loans is identical. If one is legitimate so are the others. If one is repudiated, so must the others be. The interests of American and Japanese bankers are the same.

Another Railway Loan

Another secret railway loan has been unearthed, according to Peking vernacular papers. Some time ago, the story runs, Mr. Kao En-hung concluded a loan with the Belgian-Netherlands Bank amounting to 30 million dollars on the security of the Sian-Kuanentang section on the Lung-Hai Railway, and received a sum of \$1,250,000 out of 1½ million dollars to be advanced. Later, Mr. Kao changed the security, substituting the Chingsi-Paotou section on the Peking-Suiyuan line for the section above mentioned, on account of which the syndicate refuses to hand over the balance of the advance, amounting to \$250,000. Members of parliament headed by a certain Mr. Chien brought forth a questionnaire demanding that Mr. Kao En-hung reply within three days whether he concluded such a loan, it being taken for granted that Mr. Kao is guilty of the charge if no answer is forthcoming within the stipulated period.

“Fed Up”

CHINA'S slipshod financial methods are rapidly precipitating a crisis, which may compel energetic action by her creditors to assure payment of their debts. China is now actually bankrupt, unable to meet her current expenses out of revenues and in many cases has not only defaulted but repudiated her just obligations. Sir Francis Aglen, the custodian of the customs revenue, has officially gone on record in order to protect his own good name, to the effect that in violating the principle of priority and breaking down pledged securities China has ruined her national credit, adding that it will be impossible for him to further maintain this credit.

Perhaps no nation has suffered more from China's dishonesty than Japan, and in another article we quote the official Chinese government organ to the effect that the millions advanced by Japan for strictly legitimate and honorable war purposes are now safely deposited in the foreign banks drawing interest for the corrupt officials who pocketed the advances and repudiated their obligations. We emphasize this point, which plainly intimates that the Japanese millions loaned to the Chinese government were stolen and deposited to the credit of the thieves in banks outside the jurisdiction of their government. The Chinese authorities have made no attempt to prosecute the dishonest officials and obtain possession of these funds, but have coldly repudiated their debts to Japan, saying in so many words “you have been very foolish to make advances to the recognized government of China, you deserve no sympathy and you can now whistle for your money.” We invite attention to this because in attempting to protect themselves against further unethical financial methods, the Yokohama Specie Bank has temporarily withheld a portion of the salt surplus deposited in its care for the service of the reorganization loan, for what it considers sufficient reasons. In commenting on this incident, *The North-China Daily News* alleges that this is a breach of banking honor which British banks although pressed to similar action in other instances, have steadily refused to countenance. We must agree with our contemporary in principle, but it would seem that banking honor works both ways, and although it is true that no bank has the right to question the source of moneys deposited by any individual or divulge the names of its depositors, yet in view of the numerous defalcations and wholesale plundering of the Chinese treasury during recent years, it should not be a difficult task for the foreign banks who have received these stolen funds on deposit to further the ends of justice by assisting a Chinese investigating committee to ascertain the names of the culprits. The honor of a bank like that of Cæsar's wife, should be above suspicion. The financial integrity of a nation should be on the same level. The honor of a bank very often depends upon that of a government, and we find that certain Japanese banks associated in Chinese business with the Yokohama Specie Bank, confiding in the good faith and integrity of the Chinese government have honored its obligations for five years to the tune of Y.40,000,000 and are now seriously crippled as a result of this over confidence in China's intentions to play fair. Not only have their advances been repudiated, but insult has been added to injury, a fair sample of what other creditors may expect when their claims are pressed. The Japanese banks it would seem are in no frame of mind to continue the farce and be further mulcted out of legitimate disbursements.

The present situation arises out of the fact that certain duplicate bonds belonging to the Russian participation in the 1913 Reorganization loan have been placed on the market by the Soviet government. The official explanation is that in 1913 the Chinese government authorized the Russo-Asiatic Bank to issue “advance bonds” pending the printing of the formal certificates. The war broke before the Russian bank could withdraw and exchange all the

advance bonds and such as remained were kept in the safe deposit vaults of the Russian Treasury at Petrograd where they were subsequently seized by the Soviet. Some of these were apparently marketed abroad or wherever they could be sold, and from all indications most of them went to New York. Here, some of them were presented to the Yokohama Specie Bank who paid the interest on the coupons.

In refusing now to pay this interest, the Chinese assert that ample notice was given by them that such bonds would not be honored, while the Yokohama Specie Bank declares that it was not warned in time to prevent the payment of these coupons. As a sidelight on this dispute we reproduce from the *New York Journal of Commerce* of January 4, the following letter to the financial editor from a correspondent who found himself in the same position as the Yokohama Specie Bank, and whose testimony would tend to corroborate the Japanese statement as to the time when the Chinese announced they would not honor these bonds:—

“BOUND BROOK, N. J., December 26, 1922.—The Chinese government under date of December 4 last, announced that the so-called Russian issue bonds of the Chinese reorganization 5 per cent. loan of 1913 are to be exchanged for new bonds, on the grounds that some of the bonds were seized by the Soviet government illegally, and therefore when this exchange takes place the Chinese government should be satisfied beforehand that the bonds offered for exchange are not those seized by the Soviet. I bought from some New York bond brokers during 1921 those Russian issue bonds (as Russian issue or as Chinese reorganization bonds in general) without any knowledge of such complication. I also understand that New York bond brokers are at any time to exchange the bonds they have sold and delivered to their customers if the bonds are found to be lost or stolen property. Can I request my brokers to make good my loss if they fail to produce sufficient proofs that the bonds they delivered are bonds without such complication?”

In replying to this communication the financial editor says that

“The Chinese government is replacing the 1913 loan bonds with a new issue on account of the seizure of the bonds of that issue which had been deposited in a Petrograd (Russia) bank, some of which have since appeared on the market. A recently issued circular states that exchanges will be made by the Russo-Asiatic Bank, 9 Rue Boudreau, Paris, France, and advises sending bonds of the original issue to that bank at an early date, together with documents evidencing rightful ownership, giving satisfactory proof of the origin of the bonds forwarded. Such bonds which are to be exchanged must not be of those seized in Russia. Coupons from No. 19 to those due January 1, 1923, should be included. If our correspondent's bonds were not from the lot seized in Russia they will be exchanged. Since his purchase was made in 1921 it is probable that they are not included in the number seized. In the event that they are repudiated by the bank making the exchange there is little hope for obtaining restitution from the vendors. The securities were those of a government, and authorities hold that issues of a municipality, as distinguished from private issues, are open to investigation, and the laws under which they have been issued are accessible to the public, so that investors may make any investigation necessary on their own account, which is not always possible in the case of private issues. In the event of an express warranty by the vendors restitution may be compelled. It has been held in United States courts that unless there has been an express warranty by a broker who has sold bonds he cannot, if a bona fide holder of the bonds, be held liable to a purchaser if the bonds turn out to be part of issues fraudulently placed on the market. If a buyer desires special protection he must take a guaranty (92 U. S., 447; 46 Fed. Rep., 727). If a bond is invalid because of non-compliance with statutory requirements it has been held that a purchaser cannot allege failure of consideration as a ground of recovery. The rule that the buyer must beware prevails (96 Cal., 160), and in a sale of government securities there is no implied warranty by a vendor except that they belong to him and are not forgeries; there is no implied warranty that they were legally issued.”

The point made clear in the above correspondence is that the American investor very clearly states the date of the Chinese government notice as that of *December 4 last*, while the financial editor refers to a “recently issued circular,” all of which would seem to bear out the contention of the Yokohama Specie Bank, that it was not informed officially in time to stop these interest payments. This correspondence would also seem to disprove the statement made by a Chinese official organ that the Japanese Bank purchased the bonds from the Soviet at 30 per cent. discount, and indicate that many such bonds were placed on the American market through bondbrokers having no relation to the Yokohama Specie Bank, corroborating the latter in its final statement that it also bought some of these bonds in New York.

In reference to the price alleged to have been paid by the Yokohama Specie Bank for these bonds, which the bank qualifies as a lie, it is merely interesting to recall that this discount is just about what the Chinese government now estimates its credit at, if the recent loan agreement to tide over the New Year can be taken as a standard. This loan for \$12,000,000 as reported by *Reuter* is to be issued at 82, with six per cent. commission to the bankers and at six per cent. interest which means that the government will receive 76, and by the time the bonds are peddled out to subscribers they will be selling around 70, which we can take as the Chinese estimate of their credit at the present time.

In explaining its side of the case, the Yokohama Specie Bank makes its position clear in a memorandum, the translation of which we take from the *North China Standard*.

"Under date of January 22, the Yokohama Specie Bank, through its Peking branch, sent a note to the Chinese government demanding the settlement of the account relative to the payment of the coupons of the Chinese government reorganization loan of twenty-five million pounds, issued in 1913, and announcing the seizure by the bank of the portion of the salt gabelle placed in its custody in case China should fail to settle the account. The Chinese government sent a reply to the bank under date of January 27, refuting in full the points as put forth by the bank and proposing a postponement of the settlement of the account. The bank refuses to accept the Chinese proposal and is determined to take suitable steps, although it has not as yet taken any action.

"The controversy between the Specie Bank and the Chinese government has afforded to the Chinese press, the opportunity to launch an attack on Japan, and some of them are already giving circulation to many preposterous reports regarding the matter. The bank has apparently found it necessary to vindicate itself, and has issued a statement giving a detailed explanation of the circumstances that led to the controversy. A full translation of the text is unavoidably held over, but the salient points as contained therein are as follows:—

(1) In accordance with the provisions as agreed upon, the Yokohama Specie Bank has been cashing the coupons of the 1913 reorganization loan issued by the Chinese government, receiving repayment of the money thus advanced through the Central Clearance House in London.

(2) In December 1921, the bank received a proposal from the Russo-Asiatic Bank asking for the postponement of repayment amounting to 53,860.10 pounds, on the ground that the loan bonds kept in custody at the bank in Petrograd had been confiscated by the Soviet government which made the possession of the coupons insecure. The bank refused to accept the proposal, and eventually got the repayment.

(3) Under date of January 24, coupons relative to the said loan bonds after January 1, 1922, and received repayment up to January 10 of the same year.

(This appears to be mutilated).

(4) Under date of January 24, 1922, the Chinese legation in Tokyo, sent a note to the head office of the bank, communicating the instruction from the home government that the Specie Bank should be asked to cash such coupons of the said loan bonds only, as the possessors thereof could prove legal possession before the Soviet government nationalized all the Russian banks, that is to say, before December 27, 1917, Russian calendar, while the

Bank would be responsible for the redemption of the same, in case it was later ascertained that the bonds relative to the coupons had been converted into the property of the Soviet government.

(5) Between January 11 and January 24, on which date the Specie Bank received the above mentioned communication, the bank cashed coupons to the amount of £107,476. The bank asked for repayment of the same of the Russo-Asiatic Bank through the Central Clearance House in London, when it was replied that repayment could only be made on special instruction from the Chinese government.

(6) The bank protested, on the one hand, to the Russo-Asiatic Bank, and on the other to the Chinese government and succeeded in inducing Mr. Tung Kang, the minister of finance, with whom Mr. Odagri, the director of the bank, had negotiated anent the question, to declare that the account relative to the coupons in question, amounting to 107,476 pounds, should be settled.

(7) Before the account was settled, however, Mr. Tung Kang resigned, and his successor failed to act up to his declaration.

(8) Under date of January 22, the Specie Bank sent a note to the ministry of finance asking it to take suitable measures to see the account in question settled, before the Chinese government would approach the banking consortium for the release of the salt surplus for December, and by the 27th at the latest, announcing at the same time the bank's intention to seize the portion of the salt surplus placed in its custody. In the reply, which was issued under date of January 27, the ministry of finance reiterated its own points, disagreeing with the bank's request, and proposed that the question should be left as it was for the time being.

(9) The Specie Bank is, it is true, in possession of a certain amount of the reorganization loan bonds. These were bought in New York, before the question arose, through suitable proceedings and at a suitable price. The report, indulged in by some yellow Chinese papers, that the Specie Bank purchased the bonds before warning had been given is a lie, pure and simple."

Here we have a repetition of the German Hukwang bond incident, where in order to justify their position, the Chinese have no hesitation in impugning the honor and integrity of the bankers. In the matter of the German Hukwang bonds, the Chinese deliberately accused J. P. Morgan & Company, the greatest financial house in the world, of sharp practice and prevarication, alleging that the bonds came into their possession after China had declared war against Germany and thereby justifying their repudiation. In the matter of the duplicate Russian bonds, the same aspersions are cast on the integrity of the Yokohama Specie Bank, asserting that it bought the Russian bonds after China had declared them invalid. There would seem to be a limit to such tactics in attempting to escape the payment of just liabilities. The honor of the Yokohama Specie Bank is certainly far above that of the Chinese ministry of finance as it has been conducted in recent years, and if the Japanese bank has taken drastic action to protect itself against the loose financial methods of Peking, it is probably because it is "fed up" dealing with officials who employ the reprehensible methods that have brought China's credit to its present deplorable condition.

Watch Belgium!

OUR correspondent in Brussels informs us that one of the most important financial transactions of December was the signing of a £3,300,000 sterling loan to the Chinese government negotiated through the Societe d'Entreprises en Chine, a Belgian corporation closely allied with the Banque de Bruxelles. The object of the loan is the joint construction of a railway between Paotow on the Yellow river and Ninghsia, a prolongation of the existing Peking-Suiyuan line along the great bend of the Yellow river that will ultimately connect with Lanchow. The contract provides that the Chinese government will construct the road bed and the Belgian society furnish the equipment, which, most naturally, will be Belgian. The Societe d'Entreprises en Chine is permitted to issue the bonds in lots for the above amount or for an equivalent sum in Belgian francs at the rate of 60 francs to the pound sterling. The first installment of the loan, amounting to £800,000 or francs 48,000,000, has been issued by the Banque of Bruxelles, and taken up immediately.

The Belgians have again succeeded where America has failed, and the chances are that the bulk of the above-mentioned bonds will be bought by American investors. On two occasions, American capital had the opportunity to build this line. In 1912, during the revolution, Yuan Shih-kai requested an independent American banking house to advance \$5,000,000 secured on the physical properties and earnings of the Peking-Kalgan line and the right to finance future extensions, and solemnly declared that owing to the great political significance attached by the Chinese government to this line, which commanded the approach to Peking from Mongolia, under no considerations would they ever permit it to be hypothecated to a European power, for fear of its falling under the influence of Russia. The independent American group headed by Salomon & Company, were quite prepared to advance the funds, but the state department, living up to its agreement with the other powers to lend no money to China during the internal struggle, and supporting the monopoly to the official group, declined to extend support. Convinced that

nothing could be done with the United States, the Chinese in their desperate straits for funds reversed their declared policy and entered into a secret transaction with the new Belgian group, in reality the instrument of Russia, and concluded a loan for \$5,000,000 secured on the Peking-Kalgan line five days after the president and premier had signed an agreement with the new consortium giving the latter an option on all new loans. The breach of faith cost Tang Shao-yi his position as premier. To make good this act of sacrifice the Belgians shortly afterwards signed the Lung-Hai loan with Tang's henchman, Alfred Sze, who held the position of minister of communications in the first republican cabinet long enough to put through this deal, and tie up the Lung-Hai construction work under the director generalship of his brother. Belgium, acting as the agent of Russia, brought the latter to a port on the Yangtze throwing a bomb into the British camp.

One of the lines specified in the original Siems-Carey railway contract of 1916 was from Fengchen (at that time the terminus of the present Peking-Suiyuan line) to Ninghsia. Mr. Carey was on the job within a month, with engineering headquarters at Kalgan and a complete staff ready to proceed with surveys, but when the final agreement was made public Russia was the first to enter an emphatic protest. It is well to recall that Russia considered Mongolia as a buffer state in order to keep the yellow man from becoming a menace on her Siberian borders, and any railway that might open this territory to Chinese colonization would be considered by Russia as a direct challenge to her vital policy. Whether it was Russia's protest or whether Mr. Carey finally determined that the line could not pay, that induced him to shift his activities to the Hunan-Kwangsi line is a matter of conjecture, but on the face of the contract, the line along the great bend of the Yellow river passing through Nanghsia and terminating at Lanchow, is or was an American right, which, we understand, was subsequently pooled in the consortium.

At any rate, here we have the Belgians returning to their old railway program, monopolizing the lines that converge at Lanchow and which some day will stretch further westwards towards Russian Central Asia. Joffe, the Soviet representative at Peking, has been at great pains to elucidate Russia's policy in Mongolia, which in no way differs from the flat declaration of the old Czarist government: Mongolia is not to be opened up to Chinese colonization. We hear no emphatic protests from the Soviet or denunciations from Joffe against the conclusion of the new Belgian loan which will carry out and construct the identical railway which which Russia declared could not be built when the contract was awarded to an American concern. When the Peking-Suiyuan line is extended to Ninghsia, its further extension to Lanchow will follow as a matter of course. Here it will hook up with the great Lung-Hai line, and proceed westwards. There is always the possibility of the Chenting-Taiyuan line being extended westward by the same means, also the revival of the Tatung-Sianfu line, in which case the entire system of lines in the northwest will come under Belgian influence, and unless politics in Europe take an entirely different trend, the day may well arrive when we will again witness a Russo-Franco-Belgo combination dominating a section of China which will serve as the entering wedge of ultimate Muscovite control.

The world has been so occupied with watching Japan's moves against this very menace, that it has lost sight of the real problems involved. What value is a consortium which in order to eliminate other spheres of influence, leaves the door open for the free operation of other interests whose designs upon China originated the scramble for strategic railway concessions and made the spheres of influence possible? The day will come when interest will again be diverted from the moves of Japan and once more centered upon more important intrigues which will nullify the pacts of Washington and expose China to dangers that no round table conference will save her from. Russia's aims and aspirations in Asia never change.

It is of special interest to Americans to learn that simultaneously with the floating of the Chinese loan by the Societe d'Entreprises en

Chine in Brussels, another loan of \$15,000,000 is being negotiated between the Belgian minister of the colonies and American bankers, the proceeds to be employed in railway and other improvement work in the Belgian Congo in the province of Katanga, one of the richest mineral regions in the world. The company which controls the mining interests in this district, The Union Miniere du Haut Katanga, is the largest producer of copper in the world, last year clearing a profit of nine million francs. The Katanga and Chinese interests are closely allied. The profits of the Katanga districts in ways known to financiers may well be made to serve as security for otherwise dubious Chinese bonds, and through this interlacing of interests, American bankers may find themselves financing a railway in China through Belgian banks that they declined to undertake direct.

We present these facts with a purpose. We are satisfied that whatever may have been Belgium's connection with Russia in the past, the war has modified these relations and to-day Belgian financiers are working for the exclusive advancement of their national industrial welfare. On the other hand, if Japan was to now re-open negotiations for the construction of the Kirin-Hueining and other Manchurian lines to which she holds preliminary agreements and on which she has paid considerable advances to the Chinese government, she would at once be accused of carrying out her pre-war political policy in Manchuria. Japan's railway program in these regions was forced on her by the Russian policy of conquest by railways in which both France and Belgium acted as her partners. If Belgium is now to take up the old Russian program where it left off and it is accepted as a strictly legitimate business transaction, we must not be surprised if Japan also insists upon the execution of strictly legitimate railway contracts without others raising the question of her good faith. For on this will depend to a large extent her ability to raise loans in the United States for Manchurian construction work. If Belgium is exempted from criticism and the way facilitated for the raising of loans on the American market to enable her to carry out the old Russian railway program in China, which Americans were not allowed to interfere with, then fair play demands similar treatment for Japan, whose vital interests depend upon carefully scrutinizing any new move in Chinese railway construction by groups outside the consortium. The new Ninghsia railway contract may be above criticism, but under the circumstances, it is needless to say that Japan will carefully watch Belgium.

* * *

Labor Unrest in China

THOSE who are interested in the industrial development of the Far East will find a most illuminating commentary on labour conditions in the recent strike movement promulgated by the employees of the British Cigarette Company in Hankow.

There have been various strikes on the part of foreign employed labour in the Hankow area during the last year or so, but this one is particularly worthy of attention both from the number of those affected and from the fact that the British Cigarette Company, which is affiliated to the better known British-American Tobacco Company, has always treated its employees reasonably, and afforded them good working conditions in so far as such are possible in a tobacco factory, in a climate such as that of Hankow.

To enable the reader to appreciate the situation one cannot do better than reproduce the letter received by the management of the factory from the labor union concerned, together with a copy of the agreement finally reached, and an analysis of the conditions as reported by the manager of the Company and by independent observers.

The first strike occurred in the month of October, 1922, and shortly after its settlement agitation amongst the workers was again begun, this culminating in the strike of January 3, 1923, which was followed by a lock-out on the part of the Company on January 10.

On January 15 the following letter was received by the management, a letter which may be considered typical of the attitude of Chinese labor under present conditions:—

B. C. C. FACTORY.

DEAR SIR,—The workers of your factory raised the demand for better treatment after the previous agreement was signed, and nevertheless your officers, assuming the manner of despising the workers, do not keep the agreement, but indulge themselves in treating them cruelly.

Apparently you bribe public opinion and fool the workers in the hope of making real facts confused and to reach your aim of fooling the workers.

At that time this union gave you some loyal advice in the spirit of doing justice, but unexpectedly your actions are so clear that all the workmen's clubs of this union have been irritated by your ill-treating the workers, and all our countrymen have been enraged too, thus causing the second strike of the workers of your factory.

If the people of your factory have a little sense you should accept the workers' reasonable demands at once, this being the way to protect your wealth.

On the contrary you employ such cunning methods as can never escape public notice, as in threatening to close the factory.

You must bear in mind that our workers are born with the ability to work, and they cannot be starved to death.

From this our countrymen will learn a great lesson which will forever last in our memory.

As this union still considers the friendship between the two nations, we therefore give you this final faithful advice: that is, do not use those deceptive methods which are so apparent, but accept the workers' demands at once, or else we will take the antagonistic position and call upon our countrymen to sever commercial relations with you and prohibit the cigarettes of your factory.

Do not say we have not notified you beforehand! This is the warning!

Yours faithfully,

HUPEH WORKMEN CLUBS UNION.

Hankow, January 15, 1923.

It will be observed from the foregoing that the union accused the B. C. C. management of deceiving the members of the union by failing to observe its written obligations, and threatened a complete boycott if its demands were not complied with.

Let us now look at the situation from another point of view. During the month of October last the employees of the factory called a general strike, upon which the management made a most careful and painstaking enquiry into the alleged grievances of the workers, and at their request received representatives of the Hupeh labour union in order to obtain their view of the position and to show that they were in no way opposed to the union so long as it was conducted fairly and with a sense of responsibility.

On that occasion the union representatives acted as mediators in a spirit of helpfulness, and in the interests of industry in general, and as a mark of their appreciation of this the Company sent a complimentary scroll to the union on the satisfactory termination of the strike.

On January 3, when the workers again went on strike, they left the factory without any notice, thus causing great damage to the goods of the company, which were abandoned in a condition causing quick deterioration.

The Company itself took no action until the factory had become paralysed by lack of labour, when it published its notice of January 10 calling on all workers to collect their wages, and officially stating that the factory was closed.

The management of the Company states that all the terms of the agreement signed last October have been adhered to on their part, and in evidence of that there is the fact that on November 14 there was a voluntary increase in wages of some 14 per cent., while the representatives of the Hupeh labor union who inspected the

factory expressed themselves well pleased with the conditions they found there.

The minimum wages in the factory are \$10.50 per month for the men employed there, and a rice allowance is also given, while there is extra pay for overtime.

In spite of these favourable conditions, constant agitation was carried on by people representing themselves as delegates of a B. C. C. labor union, although they held no position of responsibility in the factory, and as a result of their interference the standard of goods produced reached such a low grade that a quantity was deemed unfit for sale and had to be destroyed.

Various anonymous statements appeared in the vernacular press and elsewhere as to the various points of the agreement made in October which were alleged to have been broken, and to these the Company issued a categorical denial, asserting that it had nothing to conceal in regard to its work or the strike, and inviting the fullest publicity.

In pursuance of this idea a committee of conciliation was co-opted, and succeeded in drawing up an agreement which was more or less satisfactory to both parties.

DEMANDS OF WORKERS PRESENTED JANUARY 18, 1923.

1. (a) Restore the rights of the union representatives to have direct appeal to the management.

Agreed. Representatives of the workers' club will have the right of appeal to the management.

- (b) Reinstate the men and women workers who have been dismissed.

Agreed. The club will submit to the Company a list of workers dismissed since the first strike, whose future good conduct is guaranteed by the club, and on these conditions they will be reinstated.

- (c) Strike pay for all, and reimbursement for all workers who have been dismissed.

Agreed. The Company will make a compassionate grant of \$9,000 for its old workers.

2. New workers should be engaged on the recommendation of the B.C.C. union, and dismissal of workmen should be approved by them.

Agreed. The manager of the factory will engage new workers according to custom, but will be willing to receive recommendations from the club. Workers will be dismissed for infringements of the factory regulations.

3. The regulations in the factory should be announced and agreed upon with the union.

Agreed. Regulations in regard to dismissals and fines will be drawn up by the Company and communicated to the union.

4. Odd amounts in wage settlements should be paid in big money and not carried forward.

Agreed. All wages will be paid in big money.

5. At the end of each year an extra month's wages should be paid.

Agreed. All bonuses will be abolished, and at China New Year the Company will pay half a month's wages to those who have been in the factory for more than six months.

6. During the sickness of a worker his wages should be paid as usual when he is on recognized sick leave.

Agreed. On the certificate of the doctor at the Catholic hospital sick leave will be granted with pay.

7. For night workers, one shift shall be paid as 1½ shift. Sunday and regular holidays should be paid wages as usual.

Agreed. An addition of 30 per cent. will be made for night work. Wages will be paid by the month, and deductions will not be made for Sundays.

8. No fine to be imposed exceeding half a day's pay. Sums cruelly fined should be refunded.

Agreed. This will be dealt with in the regulations to be drafted under Article 3.

9. Those workers holding checks must be given work. They should not be turned down on account of there being no work for them.

Agreed. Holders of regular checks have first right to seats, and the holders of extra checks will then be accommodated.

10. Monthly wages to be paid, and no deductions to be made.

Agreed. Wages will be paid by the month except to piece workers.

11. Time should be given to all workers to wash their hands, and otherwise no fine should be imposed for cigarettes which are spoiled.

Agreed. The facilities for washing will be improved.

12. At 7 a.m. and at 1 p.m. the machinery should be set to work.

Agreed. Machinery will start at 7 a.m. and 1 p.m.

13. In addition to this second agreement the former agreement shall remain in force.

Agreed. The agreement made subsequent to the first strike will remain in force except where it conflicts with this agreement.

CLAUSES AS TO CLOSING THE WORKS.

1. In case the B.C.C. factory closes down the factory shall indemnify the workers by three years pay.

Agreed. Article 5 of the old agreement recognizes that workers shall not be dismissed in consequence of the strike.

2. Should the factory be closed down it shall never be re-opened. If this is violated and the factory is re-opened, the time of unemployment shall be refunded to original workers up to three years.

Agreed. Articles of the old agreement which remain in force (under 13 above) are not re-copied into this agreement.

Business men and students of economic conditions will have little difficulty in analysing this agreement, and recognizing the dangers which underly some of the clauses, and which, though they were temporarily shelved by the adroit diplomacy of the negotiating committee, will doubtless recur after a short period has elapsed.

But after reading the agreement a second time the reader may not unreasonably begin to wonder whether there is not something more than ordinary strike purposes concealed behind its apparent intention.

Most of the clauses are so ordinary as not to call for consideration, one or two of them, indeed, being already covered by the customs of the factory work or included in the previous agreement.

Clause 8, however, would be a bone of contention in any discussion between masters and men, for it is difficult to see what protection is afforded to any Company under such an agreement if, for instance, their valuable machinery or other vital processes should be injured or even destroyed by a negligent or vindictive employé.

Clause 2 is even more direct in its menace to any friendly understanding between organized Labor and Capital, for the power of approval or rejection thereby placed in the hands of the factory union would render the authority of the management practically nil, and on the other hand would afford unlimited opportunities for "squeeze" on the part of the union committee, to whom all would-be labor must first apply before obtaining the privilege of admission to the works.

But it is possible, nay, even probable, that the union, in signing the terms of agreement, did not expect to obtain a full

victory in their demands, and indeed, did not desire it, from the point of view of leaving a loophole for further agitation to enter in the not far distant future.

As for the final clauses, dealing with the problematical closing of the factory, and demanding guarantees against such an eventuality, such admissions would be almost impossible of concession, and both the workers and the management appear to have recognized the fact.

A similar demand for indemnity was made in Japan a few months ago in the case of the governmental dockyards and arsenals, and it proved to be one of such intensity as to gravely endanger the position of the politicians then in power.

It has been recognized by most students of economic conditions that the theory of pensions for a continued period of good work was a sound one, though many argue that such ameliorative measures are the duty of the state rather than that of the private employer; but this development of the argument to cover all employees of more than six months service, irrespective of the quality of their labor, cannot but be destructive to any friendly co-operation between the two parties concerned.

But it is an interesting speculation as to whether this idea was adopted *en bloc* from Japanese labor demands, whether it was propagated by Japanese labor leaders actually in Hankow, or whether it was an independant growth in the minds of the Chinese agitators themselves.

There was a strong rumor current that the Company had in their minds the possibility of a transferral of the entire factory to another site, where labor might prove more amenable to reason, and it is therefore reasonable to consider whether these demands were not drafted by the union leaders expressly to tie the hands of the management and force them to a surrender or a show down.

With regard to this point of view, it should be recognized that the factory pays every month a very large sum in wages to their 2,000 odd employees for goods which are largely sold abroad, and which therefore bring foreign money into the country, while the circulation of this credit is of the greatest benefit to the merchants of Hankow and to those producers in the interior who ship the tobacco to the factory.

There are not wanting those critics who declare that no consideration of this nature will be allowed weight for a moment, because the whole agitation is only part of a larger scheme of disruption put forward by Bolshevik agents, with the object of enlisting the youth of the Chinese labor movement in their struggle with the commercial and political relations of the rest of the world.

On the other hand, it will be discovered that practically all the strikes of any importance during the past two years have taken place in or affected British interests, and it is more than possible that some political influence, which is antagonistic on account of real or supposed injuries or opposition received, is stirring up this labor unrest as an easy point of attack, and a means of obtaining revenge.

Considering the very recent development of labor unions in China it would certainly seem more probable that the recent succession of strikes should have a political foundation rather than a social one, though we must admit that the Chinese methods of opposition and argument which are very akin to passive resistance, render them particularly susceptible to strike conditions as a means of dispute.

It cannot but be a matter of great regret to all independant students of labor movements that the Chinese, who are only just commencing their industrial development, should not have learnt from the sufferings of industrialism in the west, and realized that labor unions were created in the past to combat a sudden and unexpected evil, and that it has since become more and more apparent that only the wisest co-operation on the part of capital and labor can ensure the safety of the state and the welfare of its citizens.

(Contributed).

American Policy in China

A Question of Leadership

IF Americans are to succeed in China they must follow the example of their chief commercial rivals and pull together under an efficient organization, and above all, a recognized leader.

These thoughts come to us after reading the remarks of Commercial Attaché Arnold before the San Francisco chamber of commerce in which he follows up his previous criticisms of the representative of the American group at Peking for his conservative loan policy towards China. The *San Francisco Journal of Commerce* of November 23, presents Mr. Arnold's speech as follows:

"American trade development in China is being held back by American bankers, who persist in looking at loans in China from a narrow banking point of view, declared Julean Arnold, representative at Peking of the United States department of commerce, speaking yesterday at the weekly forum of the San Francisco chamber of commerce in the Palace Hotel.

"Trade follows the loan," said Mr. Arnold. "When the British banks make loans in China they stipulate that all material or equipment purchased through this loan must come from Great Britain. Thus the British and the other foreign banks help their own industries while helping themselves. But American bankers are demanding that China be unified and on its feet before they advance money. Instead of helping China with loans to unify itself, our bankers are standing off, while our foreign competitors are strengthening their financial bonds with China."

"Mr. Arnold spoke of the international consortium of bankers as a great movement forward, as it prevented concession scrambling and consequent heart-burnings among the different nations. But the American element is now hanging off, demanding guarantees."

Mr. Arnold's statements clearly indicate the existence of a disagreement amongst Americans as to the wisdom of the present policy of the consortium, and by reason of the fact that the head of the American group is the chairman of the consortium, his criticisms fall on his own government and its agents. In plain words, we are brought face to face with the question of American leadership in China, one that must be settled if Americans are to succeed in this highly competitive field.

It is not our purpose to question the established position of Mr. Julean Arnold as the leader of American commercial interests in China. He is by far the most efficient of all the American commercial attachés and officials of the department of commerce; as widely known as Secretary Hoover himself. In commercial circles in America the name of China is synonymous with Julean Arnold: he put China on the American commercial map. There is hardly a chamber of commerce in the United States which has not extended an invitation to him to address its members on trade

opportunities in China; there are few such invitations that he has declined. No other commercial attaché, trade adviser, diplomatic or consular official has been so frequently quoted or so highly honored. The American commercial attaché in China is a national figure.

Very little has been accomplished during the past ten years in this country that was not originated by Mr. Arnold or in which he was not in some way concerned with its success. American manufacturers and their representatives in China have contributed their part towards national trade expansion in this country but in

nearly every instance where a big deal has been put through, the business has been brought to them through the enterprise of the American commercial attaché. The records of the department of commerce bear full and eloquent testimony to his commendable initiative and fertility of resource in "bringing home the bacon." Mr. Arnold is a typical "go-getter."

When informed that Judge Elbert Gary, the head of the great steel corporation, Mr. Thomas Lamont and other captains of American finance and industry intimated that it would be best for higher American trade interests to find some harmonious and friendly solution to our difficulties with Japan so that American and Japanese bankers could co-operate through the consortium for the financial rehabilitation and industrial development of China, the American commercial attaché very quietly remarked "well, pressure must be brought to bear to compel them to modify their viewpoint."

An American official so sure of his ground as to challenge the policy of the real captains of American industry and finance for the advance of higher national trade interests in eastern Asia, wields a power that automatically elevates him above all others and gives him the undoubted right to express his opinions upon any matter which

concerns our commercial success in China. We are not surprised, therefore, to read that Mr. Arnold has thrown down the gauntlet to the representative of the American group in Peking and indirectly to the powerful financial leaders at home.

If the views of the commercial attaché are to prevail, then the representation of the American group at Peking and leadership in the consortium may just as well be handed over to one of Mr. Morgan's young bank clerks and the present high salaried financial



Frederick W. Stevens

By reason of his position as representative in Peking of the American group in the consortium, and unofficial agent of the state department in carrying out the most important American policy in China, Mr. Stevens is unquestionably the leader of American business interests in China. His success will create immense markets for American and foreign products; his defeat means a complete break-down of American policy and a return to the days of international competition in the scramble for concessions.

expert dispensed with. Or the work of the American group for the advancement of American interests in China might be handed over to a special government financial commissioner, ranking with the trade commissioner, and placed under the direction of the commercial attaché. An ideal solution that would solve for all time the question of American leadership in China. If, however, we are mistaken in this, and the great financiers and heads of American industries insist upon retaining their right to leadership and to form their own policies for what they deem best for the advancement and protection of their interests, then American leadership in China must rest with their accredited representative, and the commercial attaché should refrain from making his position more difficult than it is.

It is quite clear that the views of the commercial attaché on the questions of loans to China are diametrically opposed to those of the American group and its representative, which implies on analysis, that the commerce and state department are not working in complete accord on this important matter. The American group is as much an organ of the state department as the bureau of foreign and domestic commerce is of the department of commerce, with this difference, that while the group is composed of the most important banks of the country carrying out the policy of the government at its express invitation, the commercial attaché's office is simply an adjunct to the department of commerce, whose duty is to further in every way possible the success of a national program laid down by the department having direction over our foreign relations. If the representative of the department of commerce is to use his influence and position to destroy or make difficult the carrying out of the state department program, there can be no co-ordination or harmony, and in the end, national prestige will suffer by the defeat of our policies.

Organized British, French and Japanese business in China is directed by one supreme head. In every case it goes straight up the line to the representative of the most important financial institution operating in this country. America's competitors also have their chambers of commerce, their secretaries and commercial attachés. There are also many prominent *taipans* of trading concerns, but high above them all stands their chief financial representative. The British recognize the head of the Hongkong and Shanghai Banking Corporation as their leader. At present this position is held by Mr. A. G. Stephen. His lieutenant in Peking is the active head of the British group in the consortium and in matters connected with the financing and development of railways, the expert representative of the British and Chinese corporation speaks for him. What Mr. Stephen has to say, either direct or through his lieutenants, is listened to with respectful attention. It goes. No British firm or official understrapper would dispute his leadership or too openly condemn his policies.

It is the same with the French: the agent of the Banque de l'Indo-Chine at Peking and representative of the French group in the consortium speaks for French interests with authority. With Japan, the leadership rests with the capable managing director of the Yokohama Specie Bank in charge of Chinese business and representative of the Japanese group. There was a time, perhaps, when current criticism about the qualifications of the representative of the American group held good. Up to the formation of the present consortium, when China was split into spheres of interest and every European and Japanese loan had its political significance, there was good reason to insist that the American representative be fully acquainted with international policies and politics in China; a man who knew his Peking and its intrigues.

Every other power interested in China carefully selected the men to represent their official financial groups in Peking, and in each and every case they were promoted from the diplomatic service. Policies came first, finance afterwards. The British selected Mr. Sidney Mayers from their diplomatic service to head the British and Chinese Corporation at Peking. The French, at first had M. Casenave, one of their ablest diplomats as representative of the French group. The Germans took Herr Cordes from the consular service to represent the German group; the Japanese elevated

Mr. Odagiri from the grade of consul-general to a similar position; the Belgians took Mr. de Vos, their consul-general at Tientsin, and made him the head of the Belgian group, while the Russian group has always had the experienced banker and diplomat, M. de Hoyer, to watch over its interests. This sextet of specially educated and trained experts in Chinese affairs with the addition of one or two men in London, Paris and Tokyo know more about China than their own foreign offices, the only men in the world really competent to sit around a table and intelligently discuss Chinese problems. When the United States first entered the Chinese field we had the good sense to select a man of the same type, and in the late Willard Straight our national interests in the operations of the American group were ably protected and advanced. Straight sat around the table with the others and talked their language. When they made a move on the chessboard, he understood the play. He had been in China many years. He had lived in Peking and like his colleagues, was elevated from the consular service to the post of financial representative. When he died, there was no one to take his place. No attempt was ever made to train another man for this highly important and specialized task. Those who did succeed in doing something which might in any way fit them to carry on, were discouraged, and sat upon. Had the consortium not been formed, American financial representation in Peking would have been entrusted to men utterly unequipped to understand the moves of their competitors, and unable to converse intelligently on matters of international political importance. Fortunately, not only for China, but for America, those days are passed.

With the signing of the consortium pact and the treaties of Washington, pooling all outstanding concessions and rights and abolishing spheres of interest and special privilege, the necessity of having an American financial representative steeped in the intricacies of Chinese and international political intrigue in Peking, disappeared. Once Chinese loans and railway concessions were dissociated from international politics, they automatically became purely business propositions, to be dealt with on a purely business basis. From the American banker's viewpoint this reduced itself to adequate security and the necessary safeguards that the funds would be expended for the specific purposes of the loan. The American group, headed by the most expert financiers of the nation, therefore selected the man who in their opinion was best qualified to carry out their ideas of what constituted a bond that could be readily sold on the American market. They sent to China the best bond lawyer and expert they could find, Mr. Frederick W. Stevens.

Mr. Stevens is not only the representative of the American group in the consortium, but by reason of its official connection with the state department, the agent entrusted with the carrying out of the most important state policy our government has to date devised for advancing American interests in China. In the same manner that Mr. A. G. Stephen is the recognized leader of British commercial interests in China, as Mr. Odagiri speaks for Japan and M. Mazot for France, so Frederick W. Stevens is unquestionably the leader of American interests in China. Unless that leadership is recognized and Americans work in harmony with and contribute to his success, American policy in China will suffer another break-down.

It is necessary to emphasize this matter. Americans have suffered from an over-dose of "expert" trade advice these past few years. The time has arrived when they must face the situation fairly. The national prestige hinges on the success of the consortium. The financial initiative and leadership rests with the duly accredited representative of the American group and by reason of this position the unofficial agent of the state department. Is he to be supported or is he to be assailed by petty criticism until his position becomes unbearable and his resignation forced to make way for some new and untried griffin? The state department recently cabled the legation at Peking instructing it to support the consortium, which means, to stand by the representative of the American group, the leader who is carrying the load of bringing success to the one policy that will enable American capital to participate on equal terms with other nations in the development of China.

Sir Ronald Macleay

TRUE to its traditions, the British government sends as its new minister to China one of the dozen men in the world entitled to sit around a conference table and discuss Far Eastern problems with intelligence and in the same language as the other eleven experts. In Sir Ronald Macleay, British interests will be represented in Peking by a diplomat with a firm grasp on the larger and more delicate questions embraced in the greater political and strategical problems which at no distant date may again become acute and menace the peace of Asia. As head of the Far Eastern bureau of the foreign office and as Far Eastern expert to the British delegation at Paris, Sir Ronald developed an insight into these deeper problems which easily elevated him above the experts of other nations whose viewpoint was influenced by sentiment rather than by the facts. He represents that type of European diplomat specialized in questions which have so materially contributed to the prestige and success of their various governments whenever international conferences have been called to settle the fate of nations or whenever expert knowledge has been essential to the maintenance of a national policy in certain world centres.



Sir Ronald Macleay
The New British Minister to China

(Shanghai Times)

Sir Ronald entered the British diplomatic service in 1895, serving with conspicuous success in various capacities in Washington, Copenhagen, Brussels, Madrid, Peking and the Argentine. In addition to his Far Eastern experience and special knowledge of its problems he comes to Peking at this time ripe with experience gained in other important diplomatic centres. British interests in China are to be congratulated on his selection for this post, where he will prove a worthy successor to a long line of other highly specialized diplomats who have carried them to success in this country.

Jubilee Exhibition at Gothenburg

(Concluded from page 142)

Of special interest will be the exhibition showing in historical aspect up to the organization of to-day the municipal government of Gothenburg. Here will be found such interesting exhibits as city planning, harbor building, financial government, health service, care of the poor and of orphans, educational organization and housing problem. These exhibits will include a large number of models and plans.

Further exhibitions will be found covering handicraft—and industrial art, to include interior decoration, textiles, pottery, glass, gold and jewelry, books and printing and also a scandinavian art exhibition.

A special exhibition will cover Swedish activities now and in the past in foreign countries.

II. Industrial Exhibition of Export Goods

The most interesting part of the Gothenburg Jubilee Exhibition will, however, undoubtedly be the exhibition of Swedish export goods. It is expected that this exhibition will cover the entire field of Sweden's export industries. The following are the main departments of this exhibition.

Mining of ore, iron—steel—and metal works and factories for finished metal products, machinery, electric and instrument industries, stone industry and pottery, cement, chinaware—and glass industries, forestry, wood goods, woodpulp—and paper industries, textile, leather and rubber goods industries, foodstuff industries, chemical industry.

The exhibition will comprise not only the manufactured products but also the manufacturing processes.

It is the intention to give as complete picture as possible of the present development of Sweden's export goods industries and also to convey to the visitor an idea of Sweden's future possibilities as an industrial country. The Swedes have since oldest times been famous for their engineering ability, which has given Swedish industrial products an important place on the world markets. The export exhibition should be of great interest to foreign visitors. The buildings for this exhibition cover a floor area of about 27,000 square metres.

In order to make these exhibitions as interesting as possible they will be arranged collectively so that a complete picture will be gained of each industrial group. Through special arrangements it will be possible to show the high quality and workmanship of the industrial products. To take the iron—and steel industry a visitor shall be able to follow the total manufacturing process, beginning with the mining of the iron-ore, manufacturing of pig-iron, of steel and of the finished product. Further the use of different products will be demonstrated.

In addition to what now has been mentioned there will be a special agricultural exhibition in combination with an all-Swedish agricultural convention, an international air traffic exhibition and a scandinavian horticultural exhibition.

The city of Gothenburg will during the time of the Jubilee Exhibition be the meeting place for many Swedish, scandinavian and international conventions and finally there will be held a great international sport meeting which will be almost as extensive as the Olympic games.

Foreign visitors to the exhibition will be able to take advantage of the wonderful opportunities which Sweden offers to the tourist. Gothenburg is connected with all important places in the scandinavian countries and on the European continent with first-class railways and with ports in Europe and trans-oceanic countries through direct steamship lines.



Dah Tung Cotton Mill

British Textile Machinery in China

The Dah Tung Cotton Mill—A Brooks and Doxey Installation

IN celebrating the opening of the Dah Tung Cotton Mill located on Tsung Ming Island near the mouth of the Yangtze, its general manager, Mr. Yao Sih-chow, describes in typical Chinese fashion the origin of this self-contained enterprise which brought an up-to-date mill to the centre of an important cotton-growing district and to a local market which consumes all its product. Such a happy and fortuitous combination of business conditions is sufficiently rare in modern industrial enterprises, and in China indicates that sound business judgement is not always absent in new undertakings. Mr. Yao had spent about thirty years in general construction work, especially in the erection of cotton mills and in time was looked up to amongst the Chinese as an expert in this line. Mr. Yao says that "in the autumn of 1919, friends, natives of the Tsung Ming Island, came to consult him with regard to the erection of a cotton mill in their native town, Pao Chin. "Their years of experience had led them to feel that this organization would be profitable, I also was con-

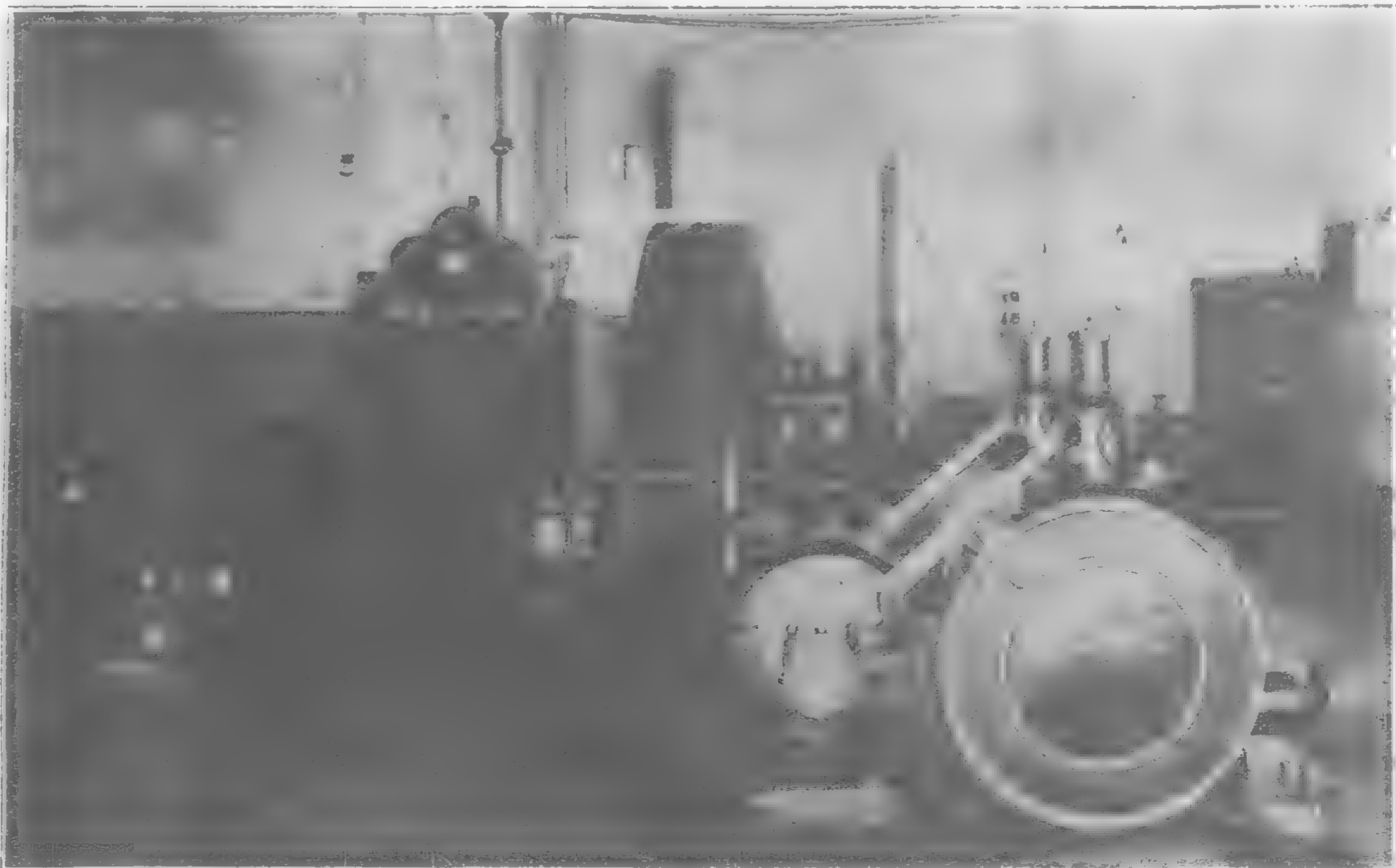


B. & W. Water Tube Boilers, 2,010 sq. ft. heating surface each, equipped with Economizer and Superheaters

vinced that this island was valuable not only for cotton growing, but also a yarn market on a large scale. Because of its great output of cotton, raw material could be depended upon, and our yarn could supply the demands of the many weavers among the population. It seemed certain that great profit might be anticipated from these two conditions. Notwithstanding this, I was not absolutely certain in my belief until I had discussed matters fully with that great pioneer of the textile industry, Mr. C. C. Nieh. He approved of the plan and rendered valuable assistance in every way."

"The rapid completion of this organization was entirely due to the co-operation and confidence afforded by my colleagues in this work both

at Shanghai and Tsung Ming. Undeservedly, I was appointed to manage the affairs in general, to secure locations, erect buildings, order plants and register in the central government. During the course of preparation many hindrances and difficulties were confronted and overcome. The most notable obstacle was the late delivery of machinery caused



Power Plant of the Dah Tung Cotton Mill: Sulzer Brothers 400 B.H.P. Engine: 1—75 H.P. Fairbanks-Morse Crude Oil Engine and 45 K.W. G.E. Generator

BROOKS AND DOXEY MACHINERY IN THE DAH TUNG MILL



Mixing Room: Equipped with one Roving Waste Opener, Waste Picking Machine, Bale Breaker, Feed Table, Automatic Hopper Feeder and Vertical Exhaust Opener



Scutching Room: Equipped with four single Beater Scutchers and Lap Machines



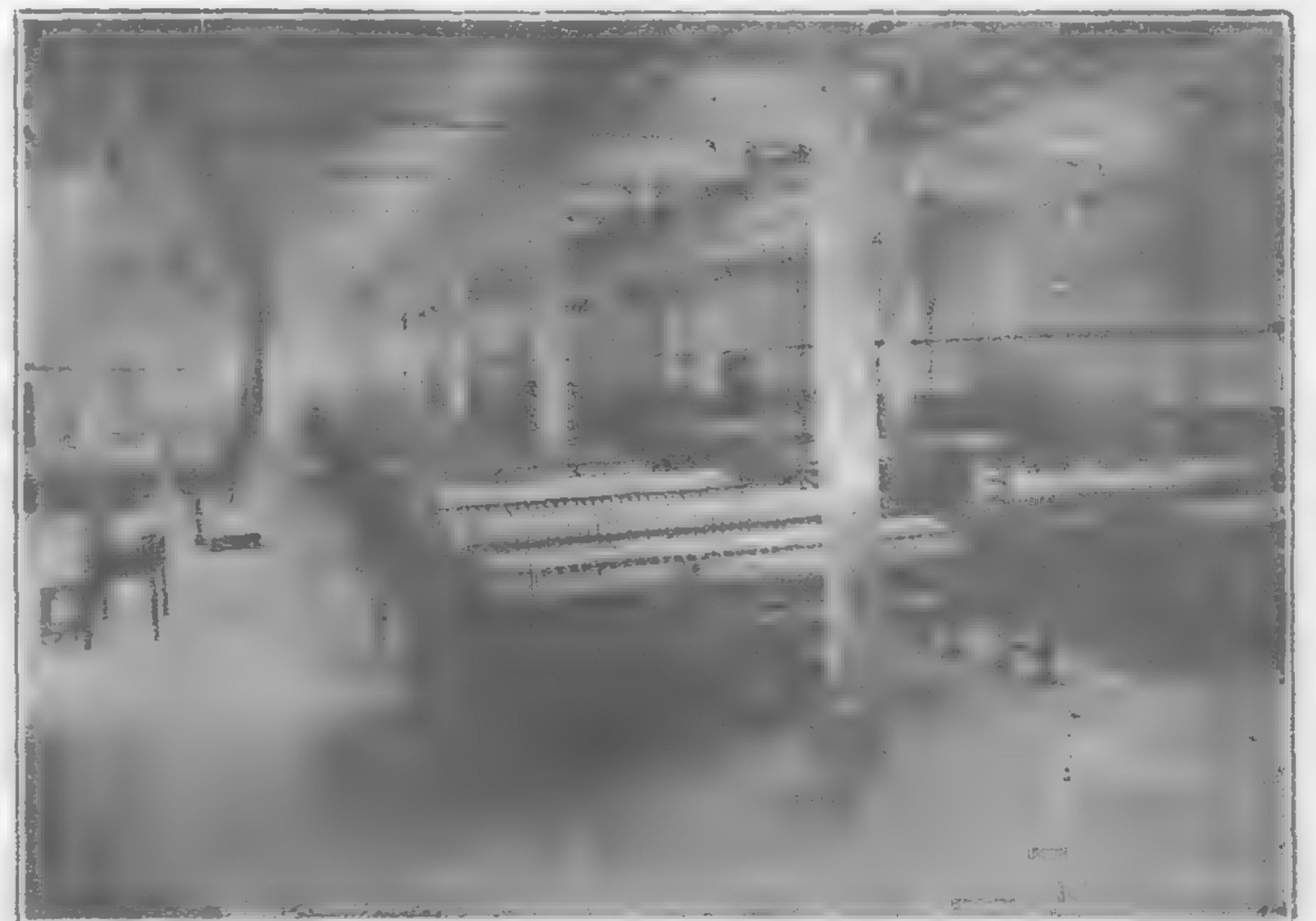
Carding Room: 42 Single Iron Revolving Flat Carding Machines



Drawing Room: 6 Drawing Machines



Slubbing and Roving Room: 6 Improved Slubbing Frames, 8 Intermediate Frames, 6 Roving Frames



Reeling Room: 70 Reeling Machines made by the Churg Wah Industrial School

by successive, serious strikes in England. But on the other hand we had the advantage of an early settlement of exchange.

"Now the organization and establishment of this undertaking have been carried to completion, after three years of strenuous labor, and it would seem that I should be able to retire. However, upon

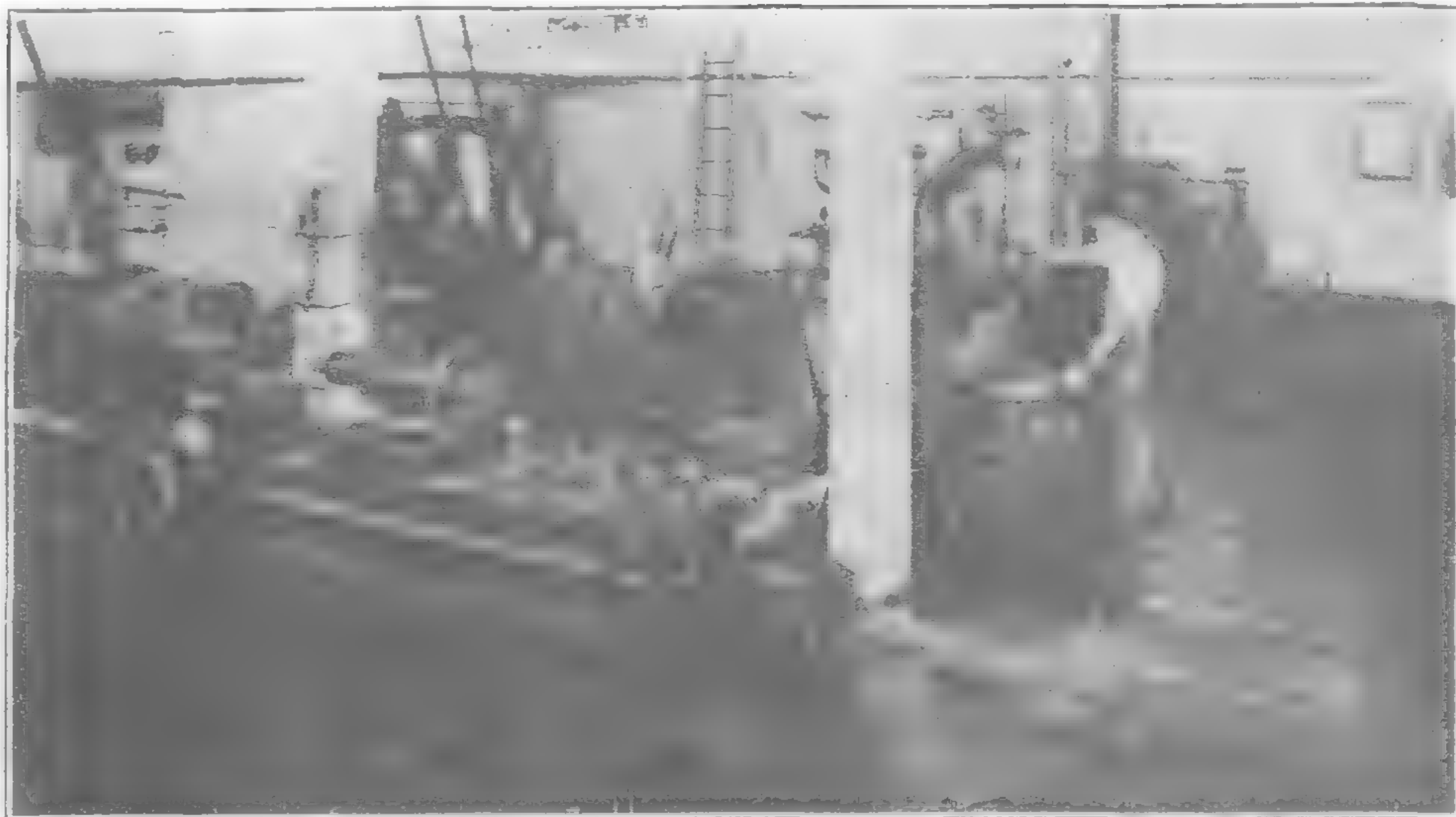
consideration I realize that the Dah Tung Cotton Manufacturing Co., Ltd. by which title the organization itself is known, has up to the present only a spinning department. The weaving department remains to be introduced in the near future, and to this goal our best energies will be concentrated."

Mr. G. S. Aveyard, manager of the engineering department of Jardine, Matheson & Company, Ltd., carried Mr. Yao's story along in his address at the official opening by saying:

"It would not be out of place to tell you something about this mill as a foreigner sees it. It is a splendid mill, and when Mr. Yao approached my firm he placed himself entirely in the hands of the textile experts and acted on their advice. He wanted a mill that could produce good yarn, in fact, the best yarn, but he also wanted a mill that could produce yarn as cheaply as possible in order that the profit per bale of yarn would be as large as possible. I can assure you that you have now a mill that will accomplish all this, the yarn that can be produced at this mill should be equal in quality to that of other mills, in fact, in many instances it will be much better and when times are bad, as we know the profit produced should always be greater than other mills. You have a mill at a low capital cost per spindle, and when times are bad and other mills are not making money you should be able to carry on without making any losses."

The main mill building is of the shed type, of the most approved modern design by a well-known Shanghai architect. Inside, the building is spacious and lofty, the machinery having been arranged with a generous regard to convenience in handling the material at the various stages, while the comfort of the work people have been carefully considered and provided for. Dormitories have been erected for the workers and staff in the mill compound, in addition to recreation buildings and grounds.

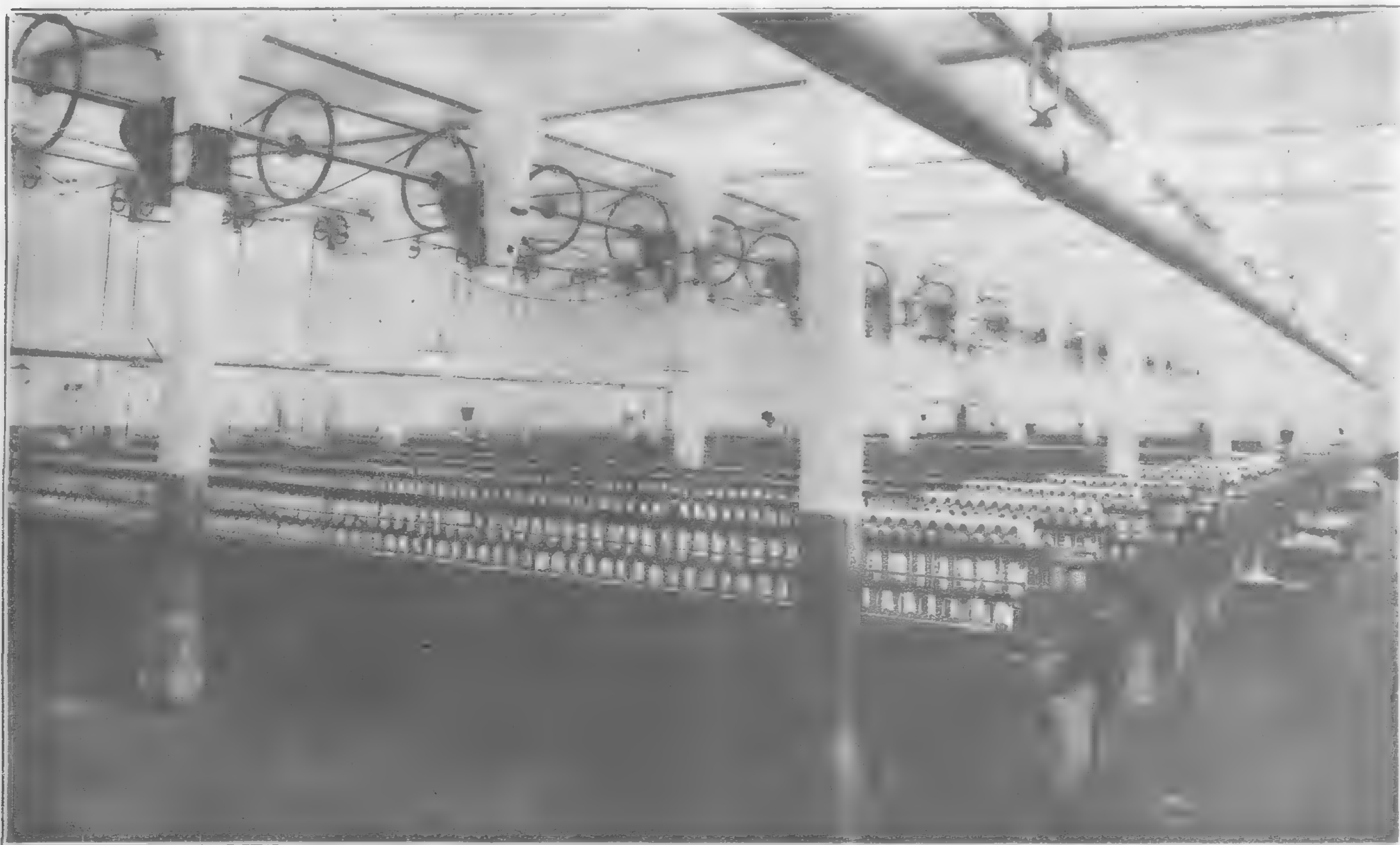
The entire plant was contracted for and imported by Jardine, Matheson & Company, who act as agents in China for the great textile machinery firm of Brooks & Doxey of Manchester, England. The whole of the mixing, scutching, carding and spinning machinery



Machine Shop: Equipped with one Lang 10½" Lathe; one Parkinsen Universal Milling Machine, one Archdale Cutter Grinder, and one 28-foot Lathe made in a local Chinese Machine Shop.

was manufactured by this firm, and represent the most up-to-date and improved types of textile machines made in England. At present, the plant is equipped with 10,000 spindles for the production of 10 to 20 counts, but provision has been made for considerable extensions. In addition, the Dah Tung Company intend to install in the near future a number of looms for the manufacture of cloth.

The power plant consists of two Babcock & Wilcox water-tube boilers, each with 2,010 square feet of heating surface, working at 160-lbs. pressure. The boilers are provided with superheaters, one Green's economizer, and two Weir's feed pumps. The main engine is a Sulzer Brothers Uniflow type of 400 B.H.P. In the engine room is also a 45 kilowatt General Electric generator driven by a 75 h.p. Fairbanks-Morse crude oil engine.



Spinning Room: Equipped with 25 Brooks & Doxey Warp Ring Spinning Frames.

In the various departments are found the following machines, all from Brooks & Doxey (1920), Limited:—

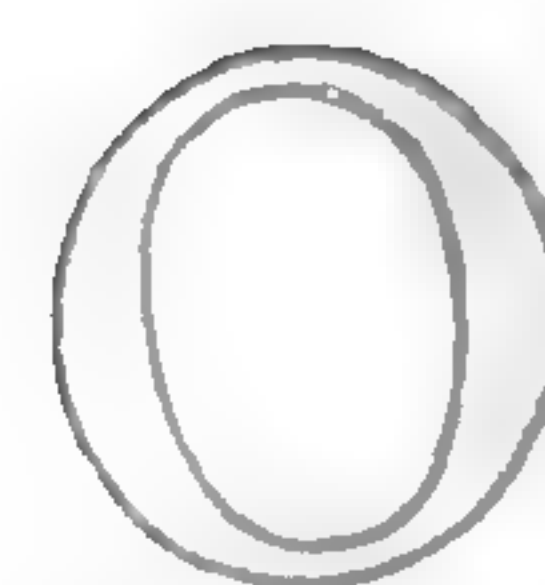
- 1 Bale Breaker.
- 1 Roving waste opener.
- 1 Patent thread extractor.
- 1 Improved automatic hopper feeder.
- 1 Improved porcupine feed table.
- 1 Improved vertical exhaust opener.
- 4 Single beater scutchers.

- 42 Revolving flat carding engines.
- 6 Drawing frames each three heads and seven deliveries.
- Improved slubbing frames 80 spindles each.
- 8 Improved intermediate frames 126 spindles each.
- 16 Improved roving frames 150 spindles each.
- 25 Warp ring spinning frames 400 spindles each.
- 3 Improved yarn bundling presses.
- 1 High speed 16 spindle braiding machine.
- 1 Patent automatic flat grinding machine.

American Textile Mills in China

The Wing On Cotton Mill

A Saco-Lowell Installation

 ONE of the most complete modern cotton mills in China built within the past few years is the new Wing On Cotton Mill which has just been put into operation and which represents in design and equipment the latest and most approved American ideas in textile engineering. The mill contains 30,720 ring spindles and was designed to spin 10's to 20's yarn.

About two years ago the Wing On Company decided to invest part of their surplus in a textile plant. This company originated about twenty-eight years ago in Sydney, Australia, with a department store. Since that time the Wing On Company has opened stores in Hongkong and Shanghai and hotels in Canton and Shanghai. Their Shanghai store is one of the most interesting establishments of the city, carrying a complete line of merchandise and serving its trade in a manner which compares favorably with large department stores in the United States. Seven hundred employees are directly connected with the store and taking into consideration the repair shop, which serves as an auxiliary to the store, and the Great Eastern Hotel, the Wing On Company carries on its pay-roll approximately eleven hundred employees. The success of the Company is evidenced in the fact that while the original capitalization has never been increased it has, in addition to the growth just mentioned, a surplus of more than three times the capital stock. When it was decided to enter the manufacturing field, the Wing On Company instructed their engineers to design a mill which in every detail would represent the latest and most approved ideas both in building and equipment. Of the results obtained they should be justly proud.

The main mill building is 565-ft. by 120-ft. two stories, with a two story L 50-ft. by 80-ft. It is of reinforced concrete throughout with steel sash and has two monitors 40-ft. wide extending practically the length of the building, which insure light and ventilation for the top floor. Throughout the building hardwood floors are used for all working spaces. There are three elevators for conveying stock from one floor to the other and several stairways located at convenient points. The lighting is well arranged, all units being equipped with metal reflectors of approved design and all wiring for motors and lighting is concealed in steel conduit. The mill is heated from its own heating plant. The picker room is equipped with automatic sprinklers.

The godown is located about 40-ft. from the picker room end of the main mill and is also of reinforced concrete construction, two stories, 165-ft. by 95-ft. It is provided with ample platforms and runways of concrete, one platform extending to the baling room on second floor of the main mill for convenience in handling bales of yarn. The godown is well lighted and equipped with automatic sprinklers.

The office building is a very handsome structure of three stories, 100-ft. by 60-ft. of reinforced concrete, well lighted and heated and with hardwood floors. The first floor contains the main office together with numerous private offices while the upper floors are fitted up as living quarters for members of the staff.

In addition to these buildings there is a spacious machine shop, a boiler house, switch house, transformer house, and a large lunch room, all of these buildings being well designed and located. A concrete tank provides for fire protection and service requirements.

One interesting feature of the plant lies in the fact that a modern sewerage system has been provided, thus eliminating one of the most objectionable features of the average Chinese mill.

The specifications for the textile machinery all of which, with the exception of the reels, was supplied by Saco-Lowell Shops, are very complete, embodying the most recent improvements, and every detail has been well provided for.

The bale of cotton is first weighed and taken from the godown across the areaway to the opener room, located in the first floor of the L of the main mill. Here it is opened by hand and mixed with cotton from a number of other bales, ample floor space being provided for this purpose. It is then delivered by hand to one of the large bale breakers connected to a vertical opener and passing through an automatic conveyor system is delivered into one of the half dozen storage bins in the picker room. In addition to the machines mentioned, a waste willow is also provided to be used when low grade or dirty stock is run.

Between opener and picker rooms, is a waste room in which is located a number of machines for handling various grades of waste. It is the intention of the mill to re-work only high grade and clean waste and all low grade waste will be sold.

In the picker room six cotton storage bins of concrete are located next to waste room partition. The stock from the bins is fed into a breaker picker, thence to intermediate and finisher pickers. The laps from the finisher pickers are carefully inspected and weighed and if the weight variation exceeds a fixed amount, are rejected and re-worked. All of the machinery in opener, waste and picker rooms is driven from individual motors.

From the alleyway in front of finisher pickers a doorway leads direct into card room where, running full length of the room, are two rows of cards. Parallel with the cards, the drawing frames and slubbers are arranged in a row extending length of mill, and the remaining space is taken up with one complete row of intermediate and roving frames. The four rows of machinery approximate the same length and this room presents a very practicable working unit, in that the stocks moves always in a forward direction.

THE WING ON COTTON MILL



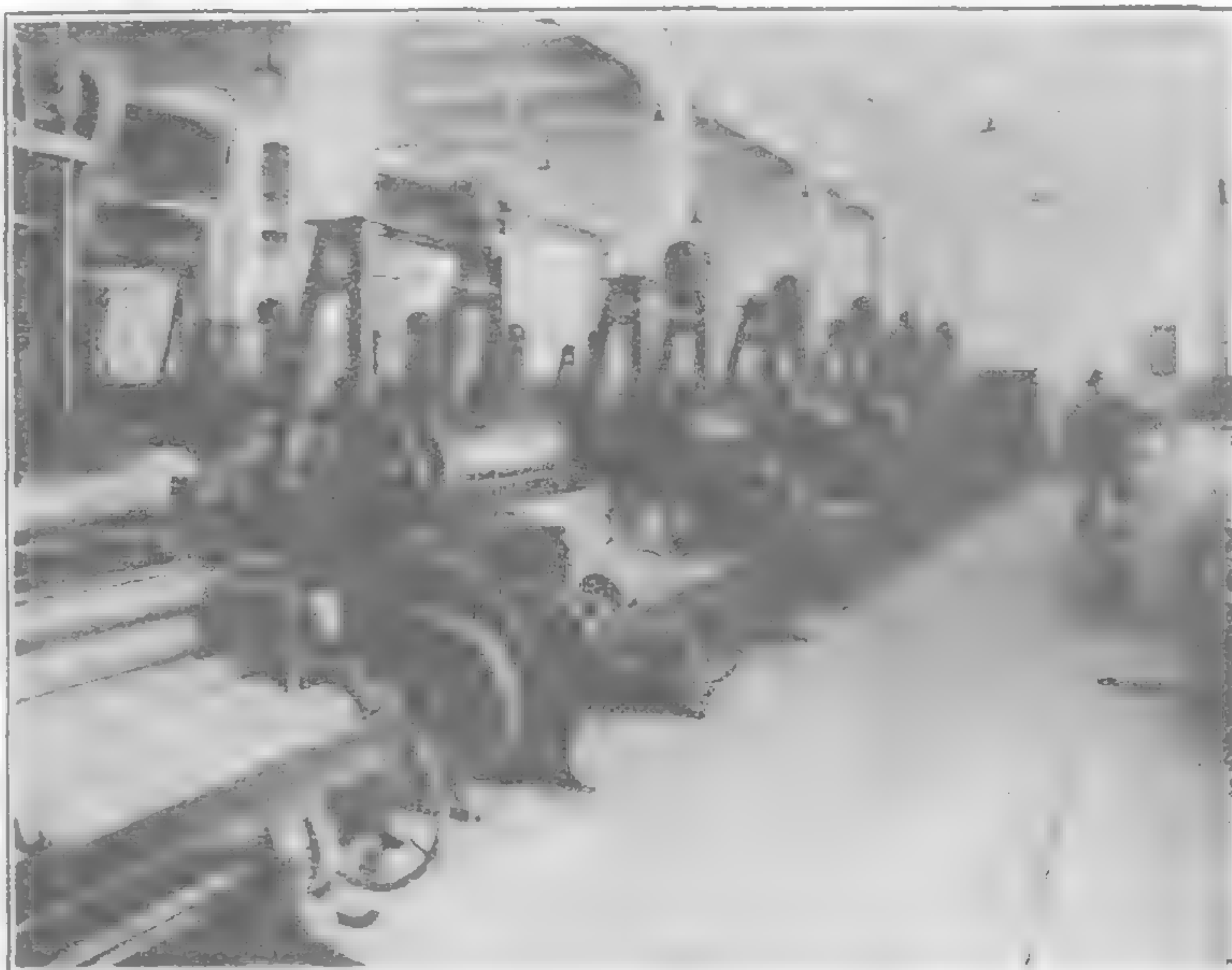
Opener Room Showing Bale Breakers and Vertical Openers in Operation



Waste Room Showing Two-Section Waste Machine and Card and Picker Waste Cleaner



Picker Room Showing Complete Set of Pickers and Distributor System over Storage Bins



Picker Room Showing Finisher Pickers

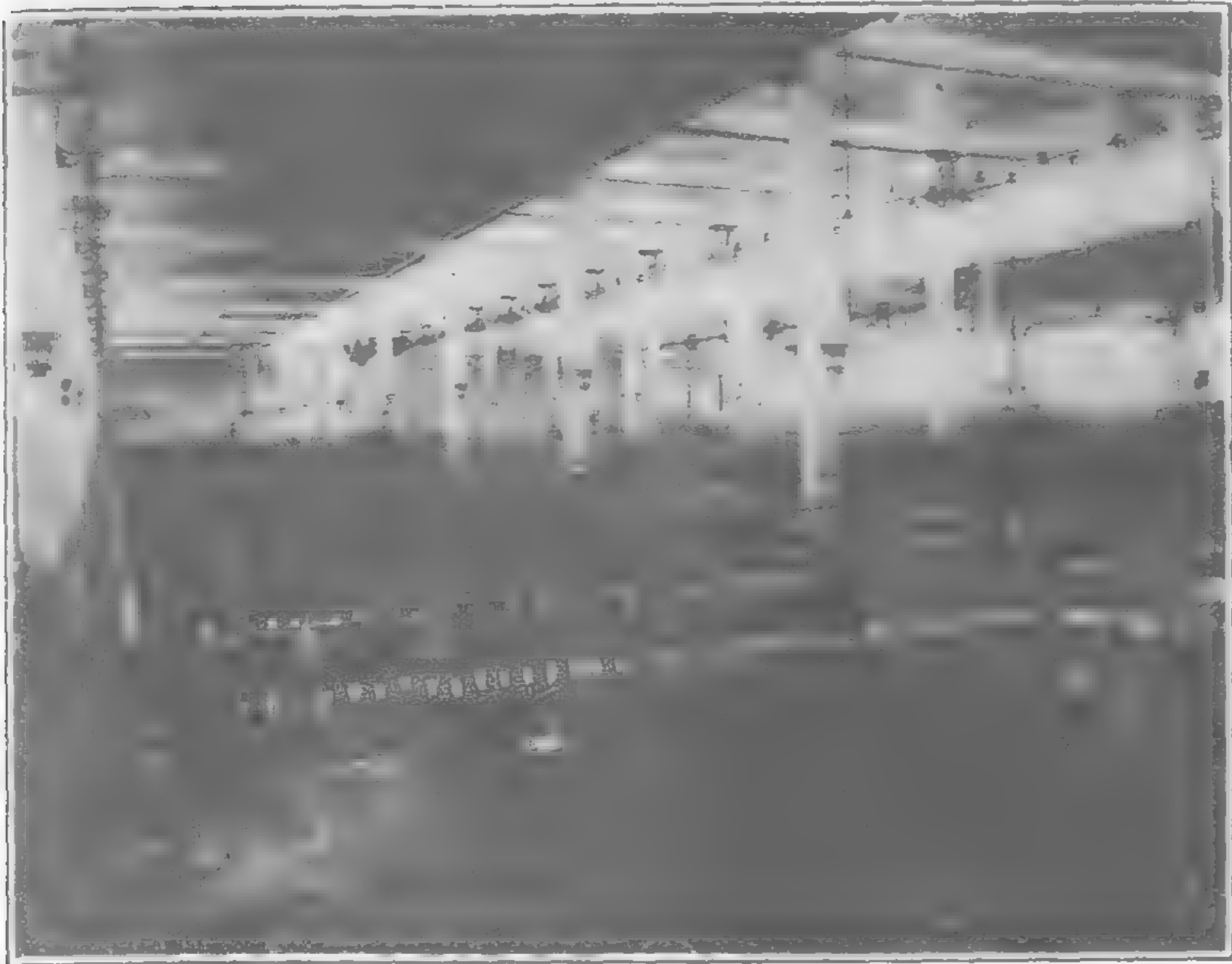


Card Room looking down Alley between Cards and Drawing and Slubbers



Card Room looking down Alley between two Rows of Cards

A SACO-LOWELL INSTALLATION



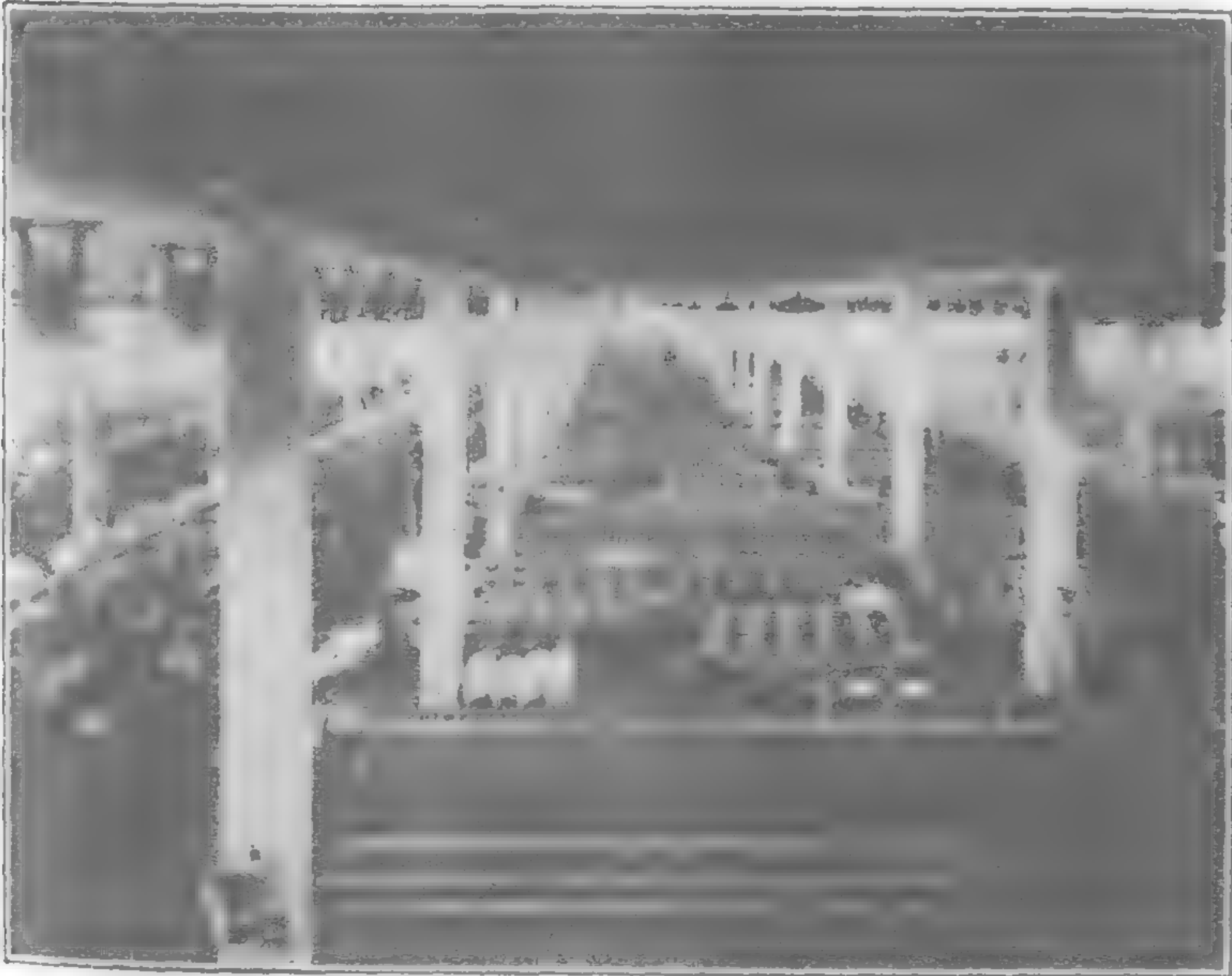
Reeling Room



Elevated View in Spinning Room



Views in Spinning Room



Elevated View in Card Room, Showing Arrangement of Drawing Frames and Slubbers



Bundling Room

The machinery in this room is driven distinct in two units. At either end of the room concrete platforms are provided for the motors, being partitioned off from the room. At each end one motor drives the two rows of cards, one motor drives drawing and slubbers, and one motor drives intermediate and roving frames, the machines from the two latter lines being driven from quarter turn belts. In each of the two sections motors, shafting and amount of machinery driven is identical. A commendable feature of this arrangement is that each motor drives direct to main line shaft and no counter shafts or belts are required. Located under the motor platforms are necessary testing rooms, overseer's room, supply room, etc. Careful attention is paid to the weighing and sizing of stock as it passes through this department.

In the spinning room there are ninety-six spinning frames, the standard 4-frame motor drive being used. These motors, as well as all others in the mill, were supplied by the International General Electric Company. The arrangement of machinery in this room allows plenty of working space and the natural lighting is excellent.

The specifications for textile machinery call for the latest improvements such as ball bearings on pickers, metallic rolls on drawing case hardened rolls on roving and on spinning frames case hardened rolls, tape drive, metallic threadboards, aluminium separators, etc.

From the spinning room, returning in direction of the godown, there are partitions across the mill which provide room for necessary testing rooms, supply room, overseer's room, etc., as well as yarn conditioning room, where the yarn is treated with proper moisture

before going to the reels. The reeling room, in which are located two hundred power reels of local manufacture, occupies two-thirds as much floor space as the spinning room. Two motors are used to drive this room and for the shafting ball bearings of S.K.F. type are used. At the end of the room a partition separates the yarn storage bins, and the bundling and baling presses, which are power driven. In the L over the opening room a well arranged supply room is located. Convenient to the baling press is the runway and platform leading to yarn storage area in godown.

All supplies and accessories are of best grade and a number of new ideas as far as Chinese mills are concerned have been introduced, such as roving boxes with rubber-tired wheels.

The heating plant is located approximately 350-ft. from the main mill. A vacuum steam heating system is used with two 5-48-10 American Radiator Company's "Ideal" boilers, but provision has been made in the boiler room for the installation of three additional boilers of the same size for future extension to the mill. The 8-in. steam supply from boiler house to mill building is carried in concrete trench. American Radiator Company's "Peerless" wall radiation is used throughout the mill. A Worthington vacuum pump handles return water of condensation and Hoffman return steam traps are used on the radiation for drips on the mains. Ample and efficient fire protection equipment has been provided throughout the entire mill.

The plant was designed by Andersen, Meyer & Company, who furnished all of the textile and electrical equipment, supplies, transmission material, and heating equipment with the exception of machinery and transmission material in reeling room, which were furnished by local concerns.

Dah Shing Cotton Mill

An American Mill Designed, Supplied and Erected by Chinese Engineers



THE completion of a 20,000 spindle cotton mill together with a 1,000 k.w. central power station within eleven months is a record which the Dah Shing Cotton Mill at Shihkiachwang, Chihli, has recently accomplished. The company was organized in November, 1921 by Messrs.

Hsu Yung-ting, president of the Hupei Government Cotton Mill, and Mr. E. F. Chang, former mill manager of the Hua Feng Cotton Mill, Woosung. The contract of supplying machinery and the complete mill equipment including designing and erection was awarded after competitive bidding to the Wah Chang Trading Corporation of Shanghai on December 5, 1921. Plans were completed in January, 1922 and construction began the following month. On September 20, the first 1,000 k.w. turbo generator unit was installed and tested and the first 10,000 spindles began to produce yarns. By November 1, the 20,000 spindles were in full operation.

Shihkiachwang is situated about two hundred miles south of Peking on the main line of the Peking-Hankow Railway, and is also a terminal of the Cheng Tai Railway connecting with Tai Yuan Fu of Shansi, and of another railway to be built which will connect with

Changchow on the Tientsin-Pukow line. Thus the town is linked by the railways connecting with sources of raw materials and markets for disposing finished goods in the province of Chihli, Honan, Shansi and Shensi. Shihkiachwang is the military strategic point in North China, but its industrial importance has not been recognized. The cotton produced in the provinces of Shansi must pass through this city before it goes to the other markets, and a large amount is also raised in the surrounding districts. The local cotton was sold at thirty dollars per picul, while the same cotton was selling at twenty-six taels or thirty-six dollars per picul in the Shanghai Cotton Exchange. There is also plenty of coal from the Chingching and Lincheng coal mines situated about one hundred miles away from the city and sold at about one-third of the price at Shanghai. The carpenters and masons and spinners

are receiving from 30 cents to 35 cents a day and skilled laborers, such as mechanics and firemen are paid from \$1.00 to \$3.00 per day.

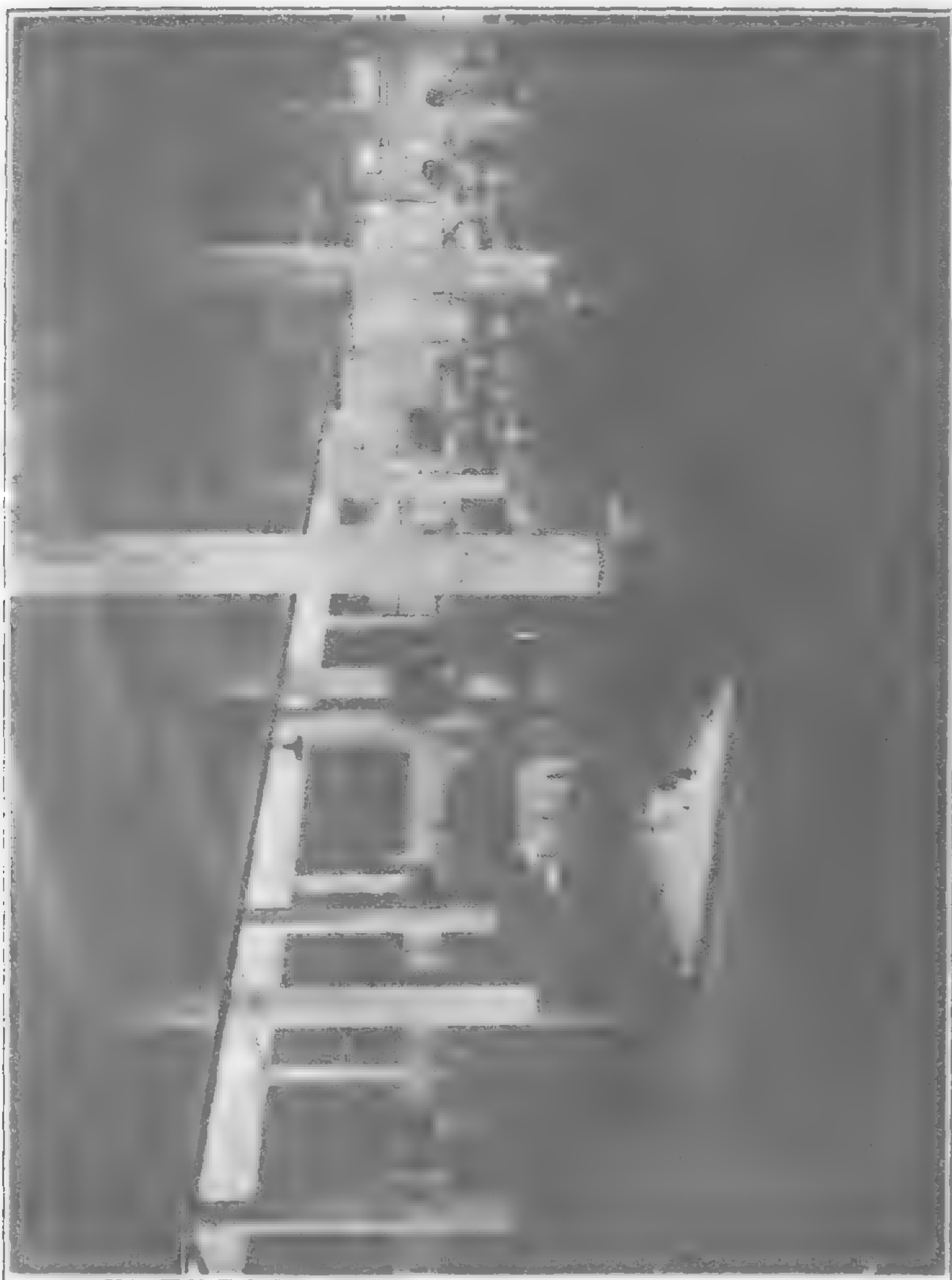
Textile Machinery

The mill is planned for an ultimate capacity of 50,000 spindles and 1,000 looms. At present it is running with 20,000 spindles. The picking machinery, cards, drawing, slubber, inter-



Dah Shing Cotton Mill: Laborer's Living Quarters

THE DAH SHING COTTON MILL: AN AMERICAN MILL DESIGNED, SUPPLIED AND
ERECTED BY CHINESE ENGINEERS



Picker Room: Woonsocket Machine and Press Company Equipment



Carding Room: 40-inch Cards from Woonsocket Machine and Press Co.



Spinning Room: Equipped with Fales and Jenks Spinning Frames



Drawing and Roving Frames: from Woonsocket Machine and Press Co.

mediates and roving frames are manufactured by the Woonsocket Machine & Press Company of Woonsocket, R.I., U.S.A., and the spinning frames by the Fales & Jenks Machine Company of Pawtucket, R.I., U.S.A., supplied by the Wah Chang Trading Corporation of Shanghai, the sole agents of the above manufacturers in China. The whole mill buildings are of reinforced concrete fire-proof construction. Provisions for heating and ventilation are well taken care of.

The main mill is a one floor concrete building with sky lights consisting of 27 bays, 13 feet in length and 154 feet in width. The picker room (128-ft. by 104-ft.) is separated from the main mill by an alley of ten feet. Three two-beater breaker lappers having one porcupine beater and one blade beater and five finisher lappers with one beater are installed. The opening room is next to the picker room separated by a fire wall. The bales are opened in the opening room, and the cotton then passes through the bale opener and blown through the condenser, then to the lattice conveyer which carries the cotton to different bins. From these bins, the tenders feed the cotton to the breaker lappers, then to the finishers. The greatest care is taken of the laps as they come off the finishers, and a set of scales is used for weighing each lap in order to ensure uniformity.

From the picker room, the cotton laps are carried to the card room, separated from the main mill by a partition wall, so that during the process of stripping, the flying waste cannot get onto the other machines. Eighty Woonsocket cards are arranged into twenty rows of four each, and spacious working alleys are allowed, so that there are ample room for repairing, stripping, grinding and transporting the laps and roving cans.

Sixteen drawing frames of two heads each, five deliveries per head are set up in two rows for two processes system. Metallic top rolls are used, as they are considered more suitable for short Chinese cotton than the leather top rolls used in other cotton mills. The twelve slubbers of eighty spindles each and twenty intermediates of one hundred and two spindles each are arranged in five thousand spindle units. The thirty-six roving frames of one hundred thirty-



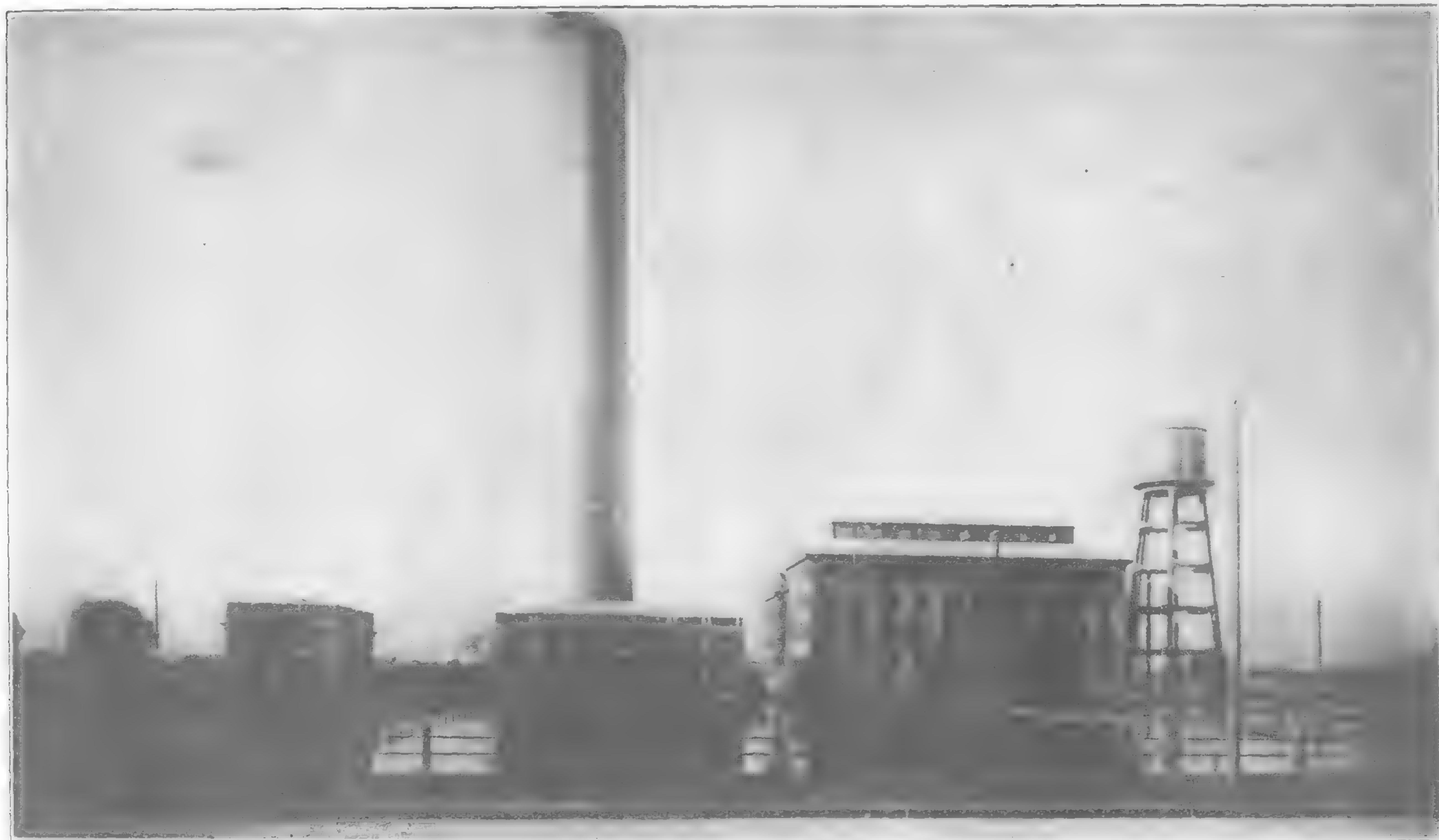
Dah Shing Cotton Mill: 3 Babcock and Wilcox Water-tube Boilers, 3,140 sq. ft. Heating Surface, equipped with Mechanical Chain Grate Stokers

six spindles each and seventy-two spinning frames of two hundred eighty-eight spindles each are arranged in ten thousand spindle units. On the slubber, intermediate and roving frames, the front top rolls have ball bearings, which eliminates friction, thus less power consumed, and longer life for the rolls. On these frames, the well-known chain drive horse head which used together with doly compound eliminates entirely the use of the angle and vertical gears and the elimination of all fast running bevel and spur gears. The spinning frames are of Fales & Jenks pattern, $2\frac{3}{4}$ inch gauge with $1\frac{3}{4}$ inch ring, equipped with self-weighted top rolls, separators, metallic thread boards, and shell front top rolls. The spindles are of tape drive regulated with tension devices, so that the spindles are enabled to run very smoothly. The production of 1.1-lbs. of sixteenth cotton yarn per day of 24 hours on the Fales & Jenks frames has been obtained by the mill within the first month of operation, in spite of inexperienced laborers.

The cotton yarn from the spinning frames passes through the two C.G. Sargent's yarn conditioning machines before reeling. The friction of the yarn condition machines is to set twist, soften the wax on the cotton fibres and to lessen breakage of yarn on reeling. The Sargent yarn conditioning machine sprays the warm water which comes out from the steam ejector evenly on to the yarn, which are laid on the apron, traveling at an adjustable speed, according to the counts of the yarn to be conditioned. A steam coil arranged under the apron is used to dry the wet



Dah Shing Cotton Mill: 1,000 K.W. Westinghouse Turbo-Generator, 3 phase, 60 cycles, 600 volts



DAH SHING COTTON MILL, SHIH-KIA-CHWANG, CHIH LI PROVINCE

Designed and Erected by the Wah Chang Trading Company

General View of Power Plant: Showing Foundry, Pump House, Spray Cooling Pond, Power House, Chimney and Water Tower

yarn at a temperature not over 120 degrees F. with a steam pressure of 35-lbs. This improved method of conditioning the yarn on the bobbins is thoroughly treated from outside to core, and dried before the same comes out of the machine. The yarn after conditioned is very soft in handling and has a better tensile strength.

Humidifier System

The dry air in Northern China causes cotton fibres to radiate from the centre and produce what is called the "oozy yarn." The modern fire-proof building with the machines running at very high speed produces static electricity, which causes more waste and poorer quality of yarn. The installation of a humidifying system has the effect of killing electricity and regulating the moisture contents in the air, thus preventing waste and broken ends. The humidifiers installed in this mill are of the turbo type manufactured by the Parks & Cramer & Co. This system gives a uniform humidity throughout the mill building. The average relative humidity in the spinning room is about seventy, and that in the card room is about fifty. No humidifiers are equipped in the picker room.

Electric Drive

Both group and individual systems of electric drive are employed in the mill. The motors are 40 degree rating squirrel cage induction type of Westinghouse manufacture. The size and capacity of the induction motors were specified exactly according to power requirements of the spinning frames in order to secure better power factor on the generator, and therefore higher efficiency, however, overloading may happen on the motors on account of changing of conditions and furthermore, the neglect of cleaning motors may be liable to cause burn out. Forty degree rating induction motor can stand a constant overload of 20 per cent.

In the picker room, the "A" frame individual drive is adopted. The breaker lapper and the roving waste opener are individually

driven by one 10 h.p. motor, and the finishers by one 5 h.p. motor. The vertical opener together with the bale opener is driven by a 7½ h.p. motor mounted on the vertical opener, while the willow and the thread extractor are driven by a common 10 h.p. motor hung from the ceiling through a jack shaft. Another motor of 20 h.p. also hung from the ceiling, drives the condenser distributing lattice and exhaust fan for the dust ceiler.

The cards are driven in groups of 20 each by four 25 h.p. motors, while four other motors of the same size drive the drawing frames, slubbers and intermediates arranged in four groups, two of which consist of four drawing frames, three slubbers and four intermediates, and another two of which consist of four drawing frames, three slubbers and six intermediates. The roving frames are driven by four 20 h.p. motors in two groups of eight frames each, and another two groups of ten frames each. For the spinning frames the Westinghouse "Universal four frame" drive is adopted, that is one 25 h.p. motor drives a group of four frames of 288 spindles each. The motors have outboard pedestal with two double faced centre, flanged pulleys on one end of the shaft, and are equipped with an extra bearing. This drive combines the advantage of individual drive. In case of breakdown of a motor, only four frames are out of commission, and it has also the advantage of group drive utilizing the advantage of high efficiency of a large motor and less first cost. The Universal four frame drive motors are suspended from the ceiling, this providing larger spaces for the spinners and ensuring greater safety to the workers.

The reeling room consists of 250 reels driven by two 10 h.p. motors and one 10 h.p. motor in the packing room drives the four small bundling presses and one large baling press. The air compressor for the humidifier system is driven by a 100 h.p. slip ring induction motor. All the motors are equipped with auto-starters, provided with overload and no voltage protections.

Power Plant

The power house is located along a railway siding, connected with the main line of the Peking-Hankow Railway. The buildings are of reinforced concrete designed for an ultimate capacity of 4,000 k.w. The generating and boiler rooms are adjacent to each other, the former being a two story building, with the condenser on the ground floor.

Boiler Room Equipment.—There are at present 3 B. & W. water tube boilers, each having a heating surface of 3,140 sq. ft. Another battery of two 3,140 sq. ft. h.s. boilers will be installed in the near future. The working pressure is 200-lbs. per sq. in. Each boiler is equipped with a B. & W. integral type superheater, having a heating surface of 427 sq. ft., capable of imparting 120° F. superheat to the steam generated. All boilers are equipped with B. & W. mechanical chain grate stokers of Linsi type, having a grate area of 70 sq. ft. The stoker shafting is arranged for steam engine as well as motor drive.

Feed Water Pumps and Heater.—In the boiler room are two steam Dean Brothers outside end packed plunger type feed pumps. There are also two other same type pumps for pumping water from the well to the water tower. The feed water heater, manufactured by the Casey Hedges Co., is of open type, having a capacity of 2,200 h.p., capable of heating 75,000-lbs. of water per hour from 80° F. to 200° F.

Turbine.—At present there is installed a Westinghouse combination impulse and reaction type steam turbine, running at a speed of 3,600 R.P.M. with 175-lbs. boiler pressure. This turbine is designed for condensing service, and operated with superheated system of 473° F. It is equipped with necessary modern indicating gauges such as tachmeter, steam pressure, bearing oil pressure, vacuum and water pressure gauges.

Generator.—The generator has a rating of 1,250 k.v.a. at 600 volts, 3 phase, 60 cycles, 80 per cent. power factor, 3,600 r.p.m., direct connected to the above turbine. The excitation is applied by a direct coupled D.C. exciter of 9 k.w. at a pressure of 125 volts. The generator is of enclosed type, and air for ventilation is treated with a Spray Engineering Co.'s air washer.

Condenser.—Westinghouse surface condenser is installed direct under the turbine having 2,500 square feet of cooling surface. This condenser is equipped with Le Blanc unit type, the air, condensate and circulating pumps, driven on a common shaft by a 125 h.p. A.C. induction motor direct coupled through a flexible coupling. The vacuum can be maintained at 29 inches when the cooling water is 75°.

Switchboard.—The switchboard, also of Westinghouse make, consists of five slate panels, one generator and exciter panel, three power feeder panels and one lighting panel. Two of the power feeder panels control two triple-conductor lead covered armored underground cables of about 1,000 feet long each supplying power to motors in the mill, while the other controls motors in the power house. The lighting panel controls six 220 volts lighting feeders strung on poles, as well as six 15 k.v.a. single-phase transformers stepping down the generator voltage to 220 volts for lighting.

Traveling Crane.—The turbine room is equipped with a 10-ton Niles-Bement-Pond hand power crane for handling heavy pieces for inspection or overhauling.

Water.—Water for power house condensing, and general mill supply is drawn from artisen wells. In consequence it becomes necessary to conserve this water, which is accomplished through a spray-system. Warm water from the condenser is discharged into a concrete spray pond where, after cooling, it is drawn to an open water channel connecting the pond with the condenser suction tunnel. The warm water is discharged against pressure through spray nozzles mounted on pipe lines on concrete stands in the pond. The spray nozzle separates the water into fine mist, thus cooling it.

The equipment consists of, as at present installed, two pipe lines each mounted with 13 spray heads of five nozzles to a hand. Each spray line is capable of cooling 2,600 gallons of water per minute and reducing the temperature from 85 degrees to 50 degrees fahrenheit. The pond is designed to accommodate two more lines when the plant is extended to 4,000 k.w. ultimate capacity.

Water Softener.—The problem of hard water which confronts all power stations in North China owing to the presence of mineral matter, particularly the objectionable sulphate and other mineral scale forming impurities on the boiler tubes. The question has been solved by the installation of a zeolite water softener. Two Sparks Upward Flow Zeolite water softeners are equipped for the water supply system for boiler feeding, the softening capacity is 48,000 gallons of water per 12 hours at zero hardness. At present, it is operated at 25 per cent. of the capacity. The principle operation of the softener is same as an ordinary filter. The only difference is that the sand is replaced by a bed of zeolite. As commercially prepared for feed water treatment, zeolite has an appearance somewhat like that of ordinary sand, but differs markedly in its properties. It is composed of two substances, namely one of which is sodium and the other a complex composition known as the zeolite radical. The operation of the softener is very simple, allowing the raw water passed through the zeolite bed from the top of the softener and which becomes completely soft or zero hardness without the addition of any chemical to obtain the softness. After 24 hours' operation of each unit, the sodium originally in the zeolite is replaced by the calcium or magnesium from the hard water. As more and more of the sodium is replaced, the zeolite gradually becomes inactive. However, the softening property of the same could be recovered by exposing the mineral to a brine solution made with common salt, which will restore it to its original condition. With the installation of the above softening plant, no scale or sludge has been found in the boiler tubes after three months' operation. The coal consumption of the whole plant has been calculated up to date at 3-lbs. per k.w. hour.

Activity in Cotton Mill Machinery

FOLLOWING the activity of cotton-spinning in Manchuria and China the competition in selling machinery for spinning is growing more and more severe daily. At present, the Fuji Cotton Spinning Company and a South Manchuria Railway Co. interest are planning to establish a factory with 30,000 spindles in Liaoyang, and the Toa Shoken Kaisha is to start a factory of 20,000 spindles in Mukden. These have been followed by the establishment of works by the Fukushima Cotton-spinning Company in Tiehling, and also by Mr. T. Wada and others, who are now to open a factory of about 25,000 spindles.

In Japan also, as a preparation for the imminent abolition of night work, many concerns are preparing to extend their factories. In consequence, not only British manufacturers of spinning machinery, but also American manufacturers have begun to compete with each other in sales. Under their instigation, the Mitsui Bussan, the Okura Gumi, Messrs. Takata & Company, Messrs. Suzuki Shoten, and Messrs. Hunter & Company, and other foreign firms are actively competing for the new business.

Hitherto, British machinery has been most popular in Japan, but the American-made machines are steadily capturing the market. Though the British machines are still superior to the American manufactures in spinning thicker yarn, the American machines do as well in spinning slender yarn. In future, the competition is generally expected to intensify, rather than slacken, as the demand for machines is on the increase.—Osaka Mainichi.

Manufacturing in Manchuria

PRIOR to the building of the South Manchuria Railway the Chinese in Manchuria were engaged almost entirely in agricultural pursuits, or primitive manufacturing industries based on agriculture. They pressed oil from soya beans for food and light, ground flour, distilled native drinks, made coarse silk, wove baskets and produced other necessities of life as a by-product of farming.

But within a very few years, with the coming of American locomotives, steam shovels, mining machinery, electric generators—all the varied labor-saving machines of the modern industrial era—a great change has taken place in this ancient land of the Manchus. Millions of foreign capital, largely from Japan, have poured into Manchuria to be used in developing her rich stores of raw materials, and in establishing new industries for their utilization. The South Manchuria Railway since its establishment has purchased in America \$75,000,000 worth of railway equipment and materials, and machinery for mining, steel-working and other industries.

The industrial development of Manchuria along modern lines is being fostered by the South Manchuria Railway through the central laboratory, the geological institute, the agricultural experiment stations, the bureau for economic research, and other similar organizations.

The growth of manufacturing in Manchuria is shown by the following reports:—

Factories in Kwantung Leased Territory (1918)					
	Factories	Capital (Yen)	Products (Yen)		
Port Arthur	15	539,500	341,179		
Dairen	155	40,880,001	109,426,117		
Palantien	7	155,000	603,544		
Pitzuwo	20	148,000	823,483		
<hr/>					
1918	197	41,722,501	111,194,323		
1917	216	36,127,661	58,313,003		
1916	204	33,628,496	43,137,839		
1915	198	21,784,865	27,697,647		
1914	187	20,936,561	14,454,438		
1913	202	20,357,630	23,534,072		
1912	204	22,424,192	22,246,852		
1907	77	1,924,174	2,681,868		

Factories in Railway Zone (1918)						
	Factories	Capital (Yen)	Products (Yen)			
Yingkou	1	55,478	90,000			
Wafangtien	14	166,000	869,262			
Liaoyang	6	451,712	1,389,510			
Anshan	11	370,000	514,585			
Mukden	10	10,676,000	3,420,255			
Penhsihu	9	7,042,000	8,355,406			
Fushun	20	6,913,850	2,143,945			
Tiehling	1	3,000,000	2,338,545			
Kaiyuan	15	900,000	1,961,217			
Changchun	18	4,291,500	3,768,216			
Ssupingchieh	5	155,000	495,630			
Kungchuling	4	85,771	304,156			
Antung	17	1,629,000	6,319,688			
<hr/>						
1918	131	33,736,311	31,970,415			
1917	117	29,855,245	29,648,862			
1916	92	16,722,531	11,666,113			
1915	71	11,593,676	9,773,849			
1914	57	3,600,269	6,344,758			
1913	53	4,009,131	4,386,513			
1912	41	2,448,265	3,681,381			

In North Manchuria and along the line of the Chinese Eastern Railway a number of factories are located. In North Manchuria the last published reports showed 18 steam flour mills, 30 breweries, 1 sugar mill and 4 steam lumber mills. Along the Chinese Eastern Railway the last reports showed 13 bean mills, 15 breweries, 13 workshops, 3 tobacco factories, 1 sugar and 12 other factories.

Bean Oil and Bean Cake—Bean milling ranks foremost in Manchurian manufacturing industry. Since ancient times the Chinese have used the oil of the soya bean as food and a source of light, but only within the past few years, since the South Manchuria Railway inaugurated its campaign of industrial development, has the soya bean and its varied products become of importance in world trade.

Native *yufang*, or oil mills, are found everywhere in Manchuria, and in these the cake is ground by mules or donkeys and the oil is expressed by hand labor. The residue is bean cake. The Japanese introduced power presses, driven by steam, electric, gas and water power, and most of the modern mills are of this type.



Practice Workshop for Chinese Students at the Ryojun (Port Arthur) Engineering College



Electro-Chemical Research Room of the S.M.R. Central Laboratory at Dairen



Anzan Iron and Steel Works



Mond Gas Power Plant at the Fushun Colliery

A much more efficient method has lately been developed through the research department of the South Manchuria Railway. This is the chemical extraction method. The beans are soaked in benzine until the oil is dissolved. Then, by heating the compound, the oil is separated from the benzine. By this method nearly all the oil in the beans is extracted, and not only is there no waste of oil, but the residue, in this case not in the form of cake but in bulk, is better fitted for fertilizer. By the expression system, 133 pounds of beans give about $12\frac{1}{2}$ pounds of bean oil and two pieces of bean cake each weighing 61 pounds. By the chemical extraction system the same amount of beans usually gives $17\frac{1}{2}$ pounds of bean oil and 106 pounds of bean meal. The new method is at present employed by only one company, Suzuki & Company, in Dairen, which firm operates the largest bean-mill in Manchuria. Yingkou was formerly the centre of bean milling in South Manchuria, but Dairen is now far in the lead, with more than sixty mills producing 390 tons of oil and 3,700 tons of bean cake a day.

The Chinese have used bean cake largely as cattle feed and very little as fertilizer. But recently the cake has found a growing market in Japan and China as a fertilizer as well as cattle feed.

To facilitate the shipment and marketing of soya beans the South Manchuria Railway has organized a "mixed storage system." Beans are classified at receiving points, and receipts, negotiable at the bank, are issued, which call for the delivery of like quantities and qualities at terminal points.

Flour Milling.—There are two kinds of flour-mills in Manchuria

called respectively *mofang* and *huomo*, which literally mean "grinding house" and "fire mill." The former is the native mill which, employing two to ten coolies and four to twelve donkeys, conducts the work on a small scale. This kind of mill is found everywhere in Manchuria, and constitutes the local manufacturer only next in importance to distilling and oil-milling. However, mills of this kind are mostly conducted as a by-work by grain merchants, distilleries and oil mills. The "fire mill" is the mill provided with modern machinery to which steam or electricity is applied as the motive power.

Flour mills planned on an extensive modern scale in South Manchuria have come into existence under Japanese management since the close of the Russo-Japanese war. The Manchuria Flour Mill at Tiehling was the first of the kind to be founded. Since then other mills have been established at Mukden, Changchun, Kaiyuan, Kirin and Dairen.

A recent Japanese consular report shows that there are 45 flour mills in Manchuria with an annual capacity of 19,000,000 bags and a market value of \$30,000,000. The Japanese mills have a daily capacity of 25,000 bags. The largest company is the Manchurian Flour Mill Company, with a daily output of 17,500 bags in its mills at Harbin, Changchun, Tiehling and Mukden. The Chinese-Japanese Flour Mills at Dairen and Changchun have an output of 5,600 bags and the Asia Flour Mills at Kaiyuan produce 2,000 bags a day. There are 36 Russian and Chinese mills with a daily output of 38,400 bags. During 1919, 1920 and 1921



Two Views of the Coke Works attached to the Anzan Iron and Steel Works



Penchiu Colliery and Iron Works



Ceramic Experimental Institute operated by the S.M.R. at Dairen

more than 500,000 tons of Manchurian wheat was exported to Europe, but this was an unusual movement due to special trade conditions. Normally Manchuria has an import balance of flour.

Beet Sugar.—One of the newest industries in Manchuria is the manufacture of beet sugar. An experimental farm was established outside Mukden in 1906, and it was shown that sugar beets could be successfully raised in Manchuria, but the industry was not established until the South Manchuria Railway had conducted successful experiments in 1913-1914. The formation of the South Manchuria Sugar Refining Company at Mukden in 1916 by Japanese capitalists followed. The Russians had previously built a factory near Harbin, and a Chinese factory had been established at Hulan, also in North Manchuria. The Mukden refinery was opened with a capital of 10,000,000 yen, and has been a great success. Beets are cultivated over an area of 6,000 acres, supplying the refinery during the winter months. Crude sugar is imported for refining during the remainder of the year.

Distilling.—The distilling of beverages for domestic consumption has always ranked as an important native industry in Manchuria. The liquors used by the Chinese are chiefly *shumshu* (sorghum alcohol), distilled from *kaoliang* and *huangchiu*, made from millet. The distilling of *kaoliang* spirit is native to Manchuria. The grain is mashed and steamed, and there is added to the mash barley-malt or bean-malt, and a small quantity of wheat or corn. The cask is buried in the ground for some days and let ferment, after which the contents are distilled. The product is similar to whisky.

Mukden and Liaoyang are the centres of the distilling industry, the output of which is about 13,000,000 yen a year.

Brewing.—From barley and hops raised in Manchuria, beer is now being made by the Manchuria Beer Brewery Company. The fermenting of *saké* has also been undertaken at various places.

Wild Silk.—The greater part of the wild-silk cocoons produced in Manchuria have been exported, and Chefoo in Shantung, a centre of the silk industry, has reeled much of the Manchurian silk. Small wild-silk filatures are operated by many Chinese farmers in Manchuria who use very primitive methods. The *tussah* silk produced by the natives has not been of good quality, and the Dairen central laboratory for some time has been devoting much attention to improving the manufacturing methods. As a result, the industry has been developing, especially in Antung. Silk spinning should eventually be one of the largest Manchurian industries.

Iron and Steel.—One of the most ambitious undertakings of the South Manchuria Railway has been the building of the great steel works at Anshan, to utilize the ore of the Anshan iron mines. Since 1917, when the work was inaugurated, the development of this plan has gone steadily forward. Millions of dollars worth of modern equipment and machinery was imported from the United States, and the installation has been made under the most approved American engineering practices.

Blast furnace No. 1 with a capacity of 200 tons a day, a charging elevator, four hot stoves, two blowing engines, four boilers, two



Interior of Asiatic Tobacco Company Factory at Yinkou



A Modern Beet Sugar Factory operated by the South Manchuria Beet Sugar Company at Mukden

generators of 3,000 kilowatts each, and settling and cooling ponds, a filter bed, a water tower, etc., were completed in 1918, and the furnace was lighted in April, 1919. Blast furnace No. 2 was completed in 1920. The charging elevator, electric tramway, water circulating system, ore depôt, etc., for the second furnace were also installed. Two batteries of coke ovens (one battery consisting of 40 ovens), together with the coal washing system, were finished, and were brought into service early in 1920. Two more batteries were added in the following year. Ultimately it is planned to increase the output to a million tons of iron a year.

At Penhsihu another steel works is in operation, producing 200 tons of pig iron a day. It draws its ores from Miaoerkow, 24 miles away. The capital (14,000,000 yen) is supplied by Chinese and Japanese.

Chemical Industry.—Notable progress has been made in the development of the chemical industry, as a result of the research work of the Dairen central laboratory, and the future holds out great possibilities and opportunities.

As Fushun coal was found to contain a high percentage of nitrogen (1.6 per cent.), a gas producer plant was installed in 1914 to recover the ammonia. A second was put up in 1917 and a third is now in course of construction. The daily output is thirty tons of ammonium sulphate and thirty tons of coal tar. Sulphuric acid, calcium carbide, calcium cyanide and other chemicals are being produced. Two sets of sulphuric acid plants, with a daily capacity of fifty tons, have been installed.

The beehive coke ovens at Fushun are producing sixty tons of coke a day. An installation of thirty sets of by-product recovery coke ovens is being planned.

At Dairen there are the Electro-Metallurgical Company, the Manchuria Barium Industry Company, the Solite Manufacturing Company, the China Electric Industry Company, the East Asia Electric Industry Company, the South Manchuria Electricity Company and the Manchuria Paint Company. At Fushun is the Electro-Chemical Company, at Mukden the Mukden Chemical Company, and at Antung the Manchuria Blasting Powder Factory.

Cement.—The ever-increasing demand for cement in Manchuria, North China and Eastern Siberia on the one hand, and the abundant presence of the material necessary for its manufacture, limestone and clay, on the other, induced the Onoda Cement Company of Japan to establish a branch factory in the small town of Choushuitzu, a suburb of Dairen, as early as 1907. The output is 250,000 barrels a year. The factory is ideally situated, the limestone being obtained from the hills right behind it and the clay in the field just in front, and a line of railway has been built to connect the factory with the railroad. The factory output consists of cement, paving bricks and building bricks. At Choushuitzu is also located the Dolomite Cement Company, and there is another cement plant at Mukden.

Glassware.—With plenty of silicious rock at hand, glass-making has been stimulated by the Ceramic Experimental Institute at Dairen, and progress is being made in the commercial development of the industry.

Pottery.—The pottery division of the Ceramic Experimental Institute was transferred to the China Ceramic Company in 1920. Other pottery factories have been started in Mukden, Dairen, Kungchuling and Choushuitzu, and in addition there are a number of kilns engaged in making firebrick. Wulakai in Kirin has long been a pottery centre.

Lumber.—Many sawmills are now in operation at Antung, at the mouth of the Yalu, and at Kirin on the Sungari river. The lumber industry on the Yalu river has been developed by the Yalu Lumber Company, a Chinese-Japanese organization established in 1908 with a capital of Y.3,000,000. This same company also organized the Yalu Sawmill Company, with a capital of Y.500,000. At Kirin are located the Mitsui Company's mill, the Kirin Timber Company and a branch of the Yalu Sawmill Company.

Other Industries.—Along the lines of the South Manchuria Railway many new industries have been started since the extension

of modern transportation facilities and the opening up of new sources of basic raw materials. The railway is fostering this industrial development through its research work, a description of which is given in Chapter V. Among other Manchurian industries brief mention may be made of the following :—

Starch is made from beans, *kaoliang* and corn by the Manchuria Starch Company at Port Arthur and the Dairen Starch Factory at Dairen. At Chientao starch is made from potatoes.

Smoking tobacco is manufactured in the Yingkou and Mukden factories of the East Asia Tobacco Company, which has grown to be a formidable competitor of the British-American Tobacco Company. Smaller tobacco factories are also located at Mukden, Dairen and Changchun.

Hard oil, stearine, glycerine and soap are made from soya bean oil by the Dairen Fat and Industrial Oil Company, and the Mukden Chemical Company is producing gelatine and animal and vegetable oils.

Bean noodles for South China and the South Seas are made by the Chinese-Japanese Bean Noodle Company. Two new companies at Dairen are making imitation rice from *kaoliang*.

The cereal *kaoliang*, as a result of research work of the South Manchuria Railway, has become useful in many ways. Calcium lactate is an important by-product. Lactate acid is made from the calcium lactate and is used extensively in fermentation, dyeing, tanning and other industries. The manufacture of paper from *kaoliang* pulp is another growing industry. The pulp closely resembles timber pulp and makes an excellent grade of paper. From the ash of *kaoliang* stalks potassium salts are obtained for use in the manufacture of glass, medicines, fertilizers and other products.

Hemp bags and other products are made by the Manchuria Hemp Manufacturing Company at Dairen, and the Manchuria-Mongolia Fibre Industry Company at Mukden.

Boat building and repair work is undertaken by the Dairen branch of the Kawasaki Dockyard Company.

Railroad car and engine shops, equipped with the best American machinery, are operated by the South Manchuria Railway at Shakakou (near Dairen) and Liaoyang. Other iron-working plants are the Dairen Machinery Works, the Manchuria Mechanical Works, the Antung Iron Works and the Osaka Iron Works.

Among other Japanese enterprises may be mentioned the manufacture of matches, gunpowder, fertilizer, dye-stuffs and wickerwork.

Paper mills at Kirin, Liaoyang and Petuna, and dyeing and weaving works at Yingkou, Liaoyang and Chinchow are among the long-established native industries.

Industries based on wool and leather have been recently started. Formerly hides, bones, wool and other animal products were exported. At Mukden are located the Manchuria-Mongolia Fabric Industrial Company (capital Y.3,000,000) and the Manchuria-Mongolia Wool-Weaving Company (capital Y.10,000,000). Other factories are located at Harbin, Mukden and Dairen. The largest is the Manchuria-Mongolia Shokusan Company (capital Y.5,000,000).

Tokio Subway Contract

The Foundation Company of New York having secured the preliminary contract for the construction of underground railways in Tokio, involving a preliminary expenditure of G. 14,000,000 and proceeding ultimately to G.29,500,000, negotiations are now in progress for financing the enterprise in New York. Competition, however, is said to be keen and there is even a chance that London will supply the funds.

The company admits that it may have to raise the capital there but points out that in that event orders for machinery and other supplies will also be placed with British houses.

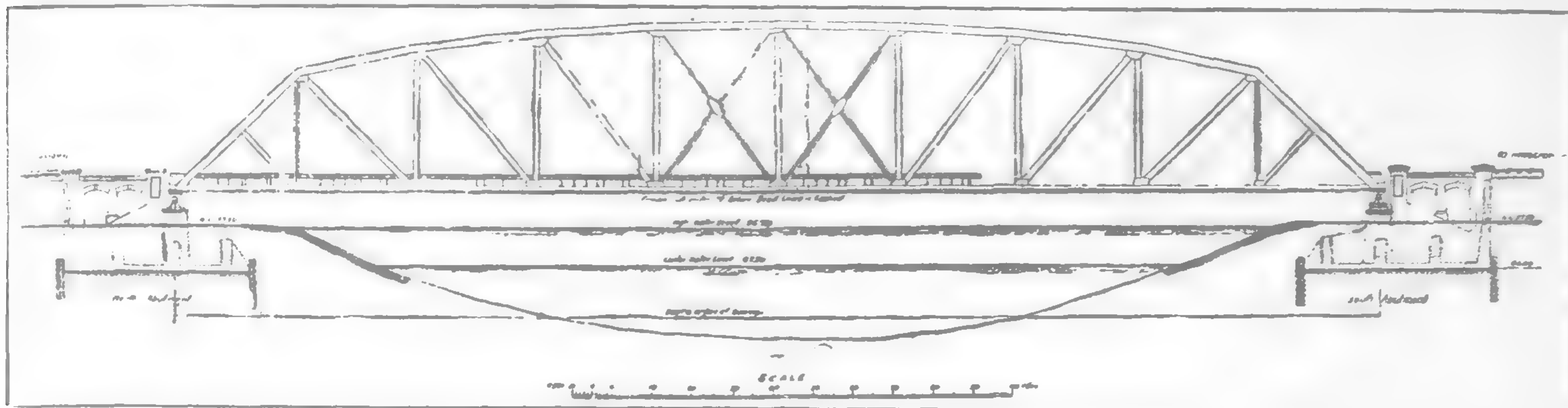


Fig. 3.

Construction of a 305-Foot Span Railway Bridge

By E. T. Forestier, A.M.I.C.E.

Paper Read Before The Engineering Society of China

THE following is a short description of the design and construction of a through steel railway bridge of 305-ft. span which carries the Shanghai-Hangchow-Ningpo Railway over the Lo Tien Wan creek, a branch of the Whangpoo river, 38 miles from Shanghai.

The new bridge, which up to the time of writing is, the author believes, the longest simple span bridge at present in China, replaces a bridge of two spans of 104-ft. each, the substructure of which was in a precarious condition and had been condemned owing to scour in the bed of the creek near the centre pier. The condition of the

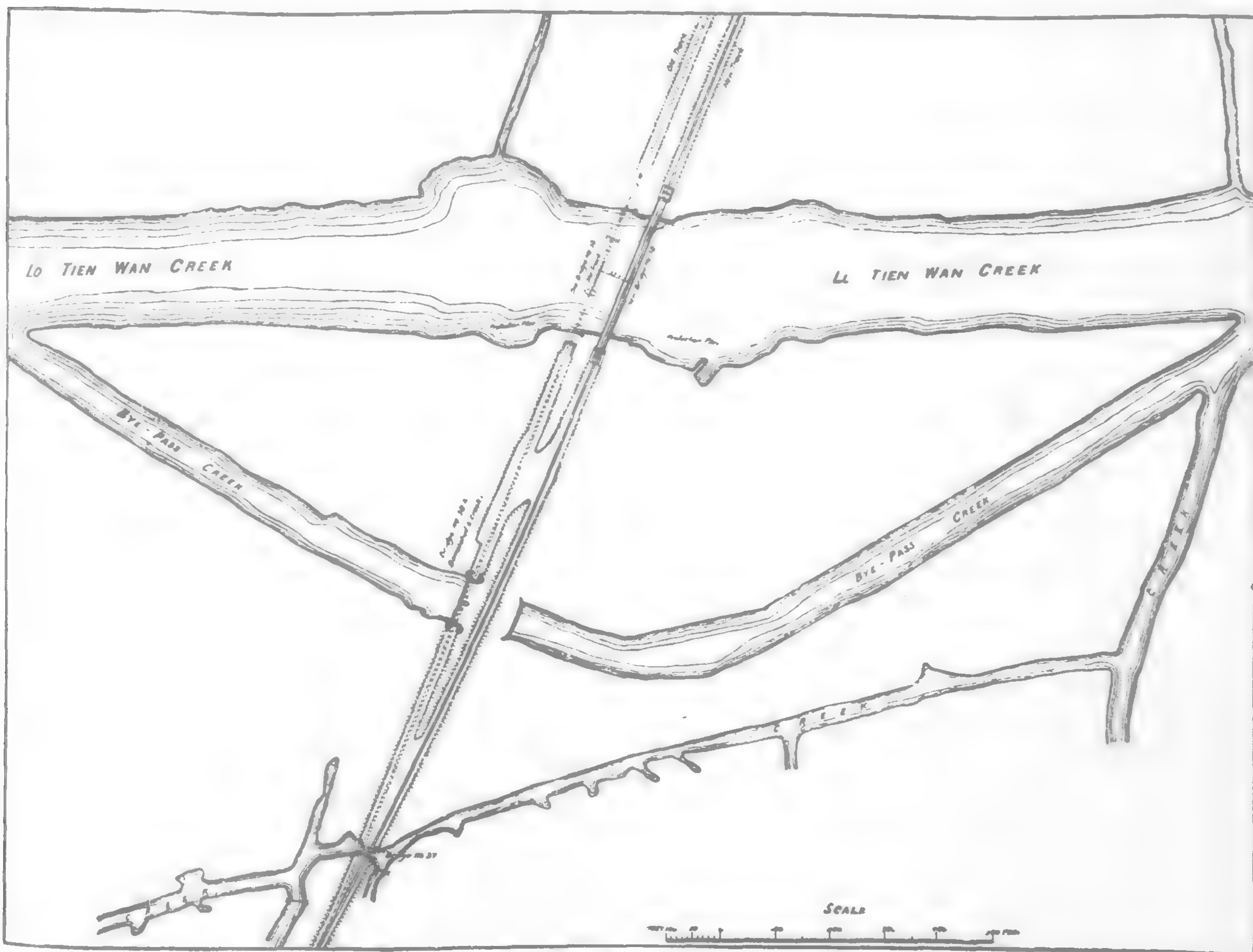


Fig. 1. Plan showing Bridge Location, By-Pass Canal and Realignment of Track

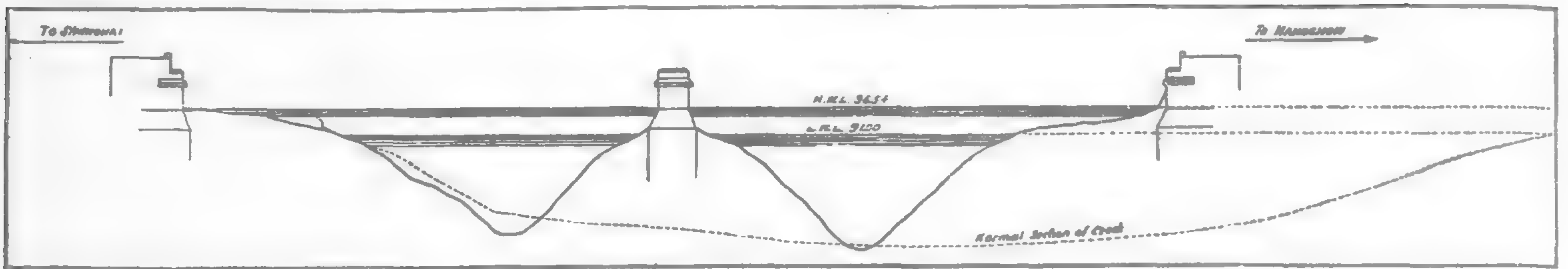


Fig. 4. Section on Centre Line of Old Bridge

old bridge, which was constructed by Chinese engineers twelve years ago, forms a very good object lesson in the dangers which are bound to arise by the restriction of a natural tidal waterway.

On referring to Fig. 4 it will be seen that the area of the cross section of the actual waterway along the centre line of the old bridge is very much smaller than the normal cross section of the creek, in fact it is only about 41 per cent. of the latter and, as the creek is tidal the velocity of the current under the bridge was very considerable.

In addition to this, the centre pier of the old bridge was not built in a line with the stream, but placed at right angles to the centre line of the bridge which crossed the creek on the skew. This caused the current to be deflected towards the bank and resulted in the bank being washed away, the erosion taking a semi-circular shape which gave a circular motion to the water and caused a whirlpool to be formed. The creek being tidal this occurrence took place both at ebb and flood tides and the effect was the same on both the up stream and down stream sides of the bridge, although more intense on the latter side. Fig. 1 illustrates this and shows how the banks were eroded by the whirlpools which were formed.

Not only were the banks of the creek damaged, but, what was much more serious to the safety of the bridge, the whirlpools scoured craters in the bed of the creek 77-ft. deep on the down stream side and 40-ft. deep on the up stream side, measured at high water. It was the former scour which caused the danger to the pier, as the latter was just at the edge of the crater.

It was not long after the old bridge was completed that the Chinese builders realized the mistake which had been made in restricting the waterway, and a canal to act as a by-pass, and so relieve the main stream, was excavated round the bridge on the north side, see Fig. 1. The relief given by this by-pass was, however, very small, if not negligible, as was subsequently shown after it had been stopped up by the new bank which was constructed to carry the new track diversion. After considering several schemes it was decided to construct a new single span bridge 55-ft. away from the old bridge and measuring 305-ft. span between centres of bearings. This necessitated realignment of the track for some distance, but this work presented no difficulty.

Substructure.—On account of the very bad nature of the foundation, the abutments of the new bridge, due to the heavy load they have to carry required special consideration, the ordinary mass masonry type of bridge abutment being out of the question as its own weight, in order to distribute the load over a sufficient area, would have been excessive. It was natural, therefore, that a reinforced concrete raft abutment was adopted.

The load on the foundation is made up as follows :—

Superstructure—

Steelwork, etc.	...	...	253 tons
Train load	...	...	400 "
			653 tons
Substructure			707 "

Total 1,360 tons

The allowable bearing pressure employed is 1,200-lbs. per square foot and, in order that the average pressure, i.e., the total weight divided by the bearing area, should not be more than this amount, the size of the foundation was made 52-ft. by 47-ft. In addition the foundation is piled with 12-in. square piles 40-ft. long staggered at 4-ft. centres to provide for the eccentric load; also, the edges of the foundation are piled with sheet piling 5-ins. thick and with guide piles 10-ins. square, both 30-ft. long. All piling is of Oregon pine.

As the foundation was particularly bad it was decided to try and consolidate the ground by driving the sheet piles first and the 12-in. bearing piles afterwards. This, however, did not work out in practice, because when the bearing piles were being driven the sheet piling was bellied outwards, and after the latter had gone as far as its flexibility permitted, the earth contained within the foundation was forced upwards. In view of the results obtained with the method

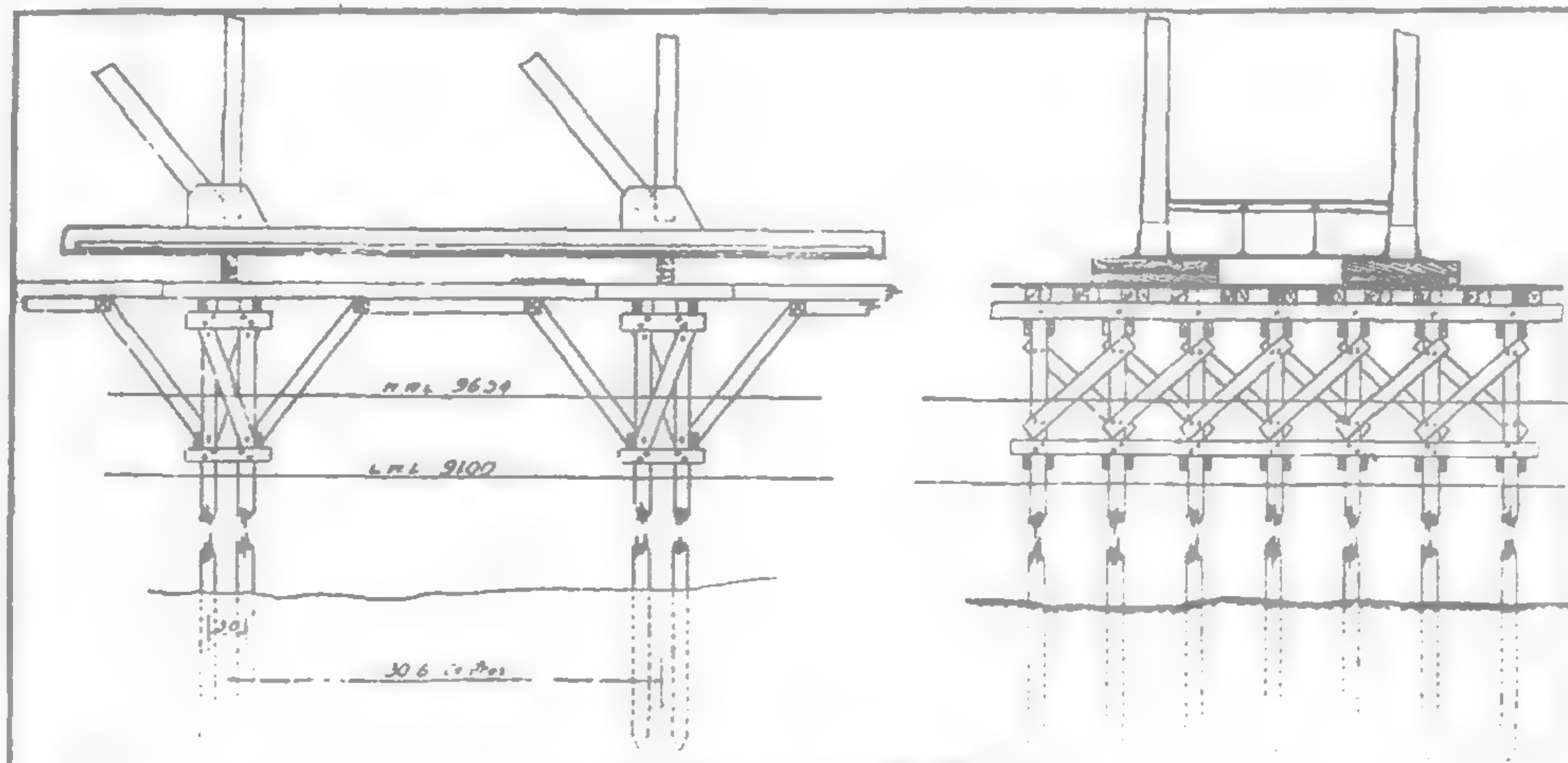


Fig. 5. Detail of False Work

adopted in piling these two abutments and also experience on other work in this part of the country, the author is satisfied in his own mind that it is impossible to consolidate the ground more than what it is in its natural state, by any such means as just described. The author, however, wishes it to be distinctly understood that he refers only to the ground below what might be termed "the level of permanent saturation;" also, that these observations apply to the silt as usually found in the Yangtze valley flats.

Above the level of permanent saturation it is quite possible to consolidate the ground, and excessive settlement of a structure whose foundations do not reach to this level is probably nothing more or less than the compressing of the ground above this level.

The author is strongly of opinion that while the bearing pressures usually adopted in Shanghai may be satisfactory when applied below the saturation level, they are far too high when applied to the soil above this level, and that for important structures it is essential to carry the foundations below this level; also, he is of the opinion that the allowable bearing pressure of 1,700-lbs. per square foot usually employed in Shanghai is too high if employed



Fig. 6. Bridge No. 38

without piling. As already mentioned, the pressure worked to was 1,200-lbs. per square foot, which is the maximum pressure employed by both the Shanghai-Hangchow-Ningpo and the Shanghai-Nanking Lines, but even so no important structure is usually erected without the foundations being liberally piled, and results have shown that this practice is sound, as settlements have been small and of no account. More trouble, however, has been experienced with abutments sliding than settling, and a pair of abutments, which were a record as far as sliding was concerned, were also a record as far as settlement was concerned, in so far that after they had moved the settlement was hardly measurable.

The shoes of the bridge rest on two pedestals which form part of two main inverted cantilever ribs, 3-ft. thick. These main cantilevers are connected together and distribute the load to four cross beams, which in turn distribute the load to the main slab. The cross beams, as will be seen from the diagram, are in the form of beams supported at two points with cantilever ends, the points of support being the main cantilevers. It will be noticed that the lengths of the cantilevers of these cross beams are rather long in proportion to the middle part, and consequently the advantage of continuity is not fully obtained, in fact, the moment in the centre part is a negative moment. This is unavoidable as the distance apart of the main cantilever ribs is governed by the distance apart of the main girders. The upper part of each main cantilever is merely a wall supporting the concrete cross beams which carry the track on the abutment, and which for lightness and appearance, is made in the form of two arches. The wing walls are thin reinforced curtain walls going only 1-ft. below ground level and are made monolithic with the abutment at the high end and at the low end supported by a pillar resting on the end of the rear cross beam. This design was adopted, in preference to carrying the wing walls down to the foundation slab, as it is of lighter construction, and the question of reducing dead-weight was the governing factor of the design.

Horizontal struts are provided between the cross beams supporting the track to allow for the side bending moment which is introduced in these beams by the longitudinal force created by the sudden application of the train brakes.

All main reinforcing steel is of 1-in. square rib bars while $\frac{3}{4}$ -in. square bars are used in the floor slab, all minor shear reinforcement, etc., is of $\frac{3}{4}$ -in. diameter indented bars. Altogether there are about 26 tons of reinforcing steel in each abutment. The stresses used in the steel and concrete are 16,000-lbs. and 600-lbs. per square inch respectively, and the concrete is of 1 : 2 : 4 mix.

Levels taken about two years after the bridge was finished, indicated a maximum settlement of 1.20-ins.

Superstructure.--The girders have curved upper chords with N type web member bracing and call for no special comment. A good idea of the bridge can be obtained from Figs. 3 and 6.

A few remarks regarding the falsework, however, may be of interest. Fig. 5 shows a typical cross section of the falsework which, as will be noticed, is rather substantial and had to be on

account of the depth of water and the soft nature of the creek bed for several feet down and which was liable to cause excessive settlement due to the weight of the steelwork, a rather serious matter in the case of a large bridge on account of the difficulty of jacking up. Events subsequently showed that the number of piles in the bents was by no means excessive, as just before the girders were closed in the middle, a gang was employed doing nothing else but jacking up the panel points. The settlement, however, was not excessive, and was kept in check by the jacking gang without difficulty, although the full camber as provided by the design, was not quite obtained, but the last middle section of both top chords entered without difficulty. However, there was not a sixteenth of an inch to spare. The length of the longest piles used for the falsework was 68-ft., they were 12-ins. square and, of course, had to be spliced. Another reason for making the falsework substantial was in order to withstand the wind pressure on the bridge before the structure had been closed, and also the side pressure caused by the flow of the water. The height of the girders is 43-ft. in the centre, and the distance from the top of the falsework to the creek bed about 49-ft., therefore making the highest point about 92-ft. above the bed of the creek.

After the new bridge was opened to traffic the steelwork of the old bridge was removed and the centre pier and south abutment blown up and reduced to 5-ft. below low water and the creek widened on the south side to its normal width.



Fig. 8. Removing Span of Old Bridge No. 38.

The old deck span was easily landed, but the through span required considerably more work. Two native boats of about 50 tons capacity were floated underneath and falsework built up on these. Due to the tides not being high enough to balance the displacement, it was not until the third attempt that the bridge could be floated, but on this occasion the tide was at its highest and the shoes cleared by about an inch, which however, was sufficient to float it out. Fig. 8 shows the span being floated out.

Anzan Cement from Slag

The results of technical tests held over samples of cement manufactured from the slag produced at the Anzan Iron and Steel Works, by the experts of the central laboratory, Dairen, and also the Anzan Works have shown that, in pulverization, expansion, and tensile power, etc., Anzan cement is found to compare favourably with Portland cement, as demonstrated by the use of over 200 barrels thereof.

In passing, the annual consumption by the S.M.R. Co. alone averages 300,000 barrels.

Cement-manufacturing promises to be another lucrative enterprise for the Anzan Works.

The current quotation is Y.4.60 per barrel in 3 bags for delivery at Lishan station. Each bag being bought back for 20 sen each, the net price is Y.4 per barrel, which is very moderate.

Conservancy Work in China

THE rivers of China may be considered to be her chief commercial routes up to the present time, partly owing to the lack of roads, and partly owing to the slow development and maladministration of the railways, which in most countries would necessarily be the chief traffic carriers.

Having regard to the vital importance of these rivers it is well worth while to consider what steps can be and should be taken to conserve them, in order to render them both more efficient in their

of the source or the course of the river, brings sudden destruction in its wake.

Changes in the vegetation and forest growth over the drainage area, the cutting of timber, and the placing of land under cultivation, thus serving to increase the rapidity of the drainage, all have their share in increasing the dangers of floods.

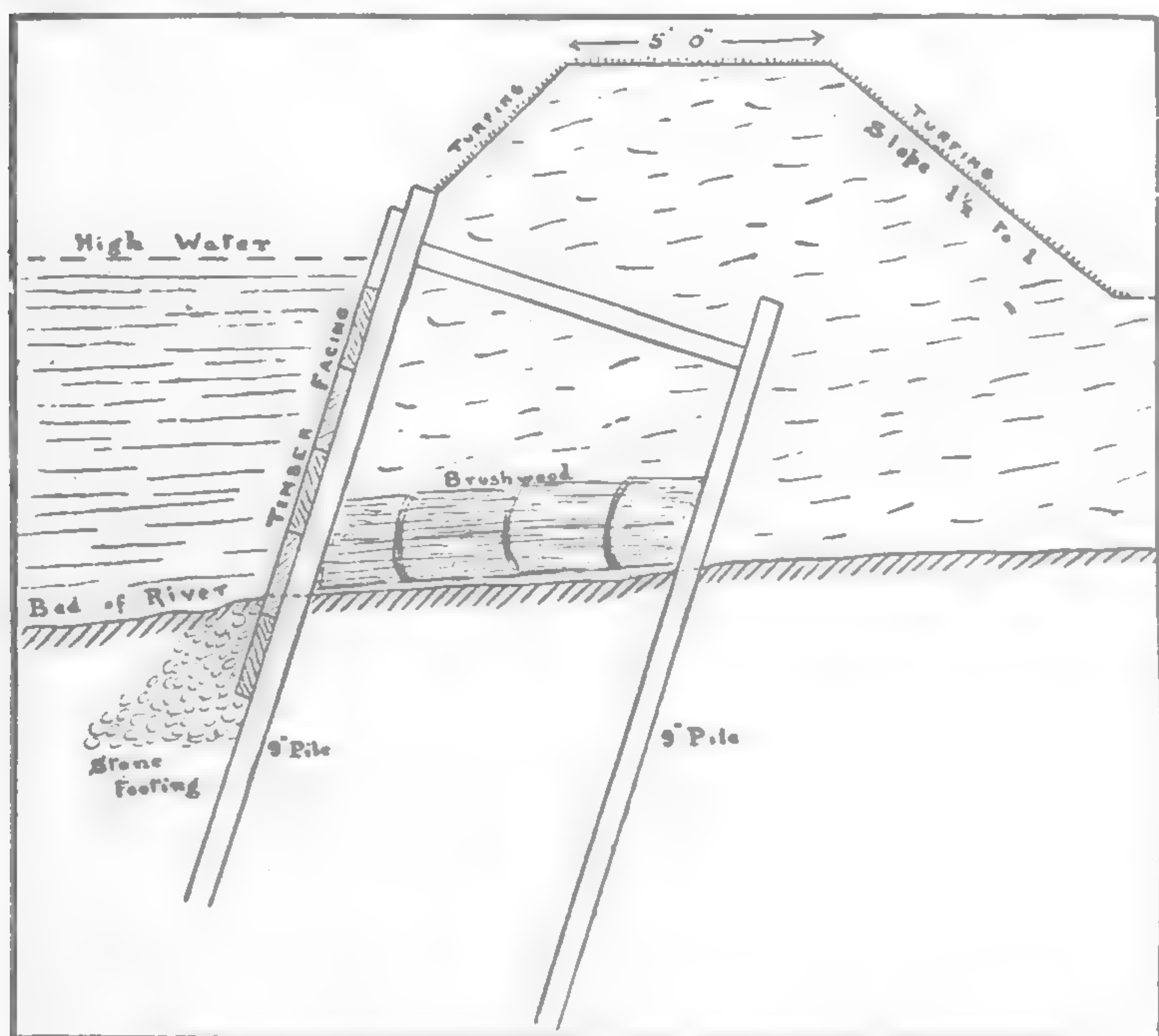
Furthermore, a non-tidal river with a constant flow has a tendency to erode its banks, due to the fact it impinges alternately against either side, scouring the bank on the concave side, and then becoming diverted to the concave bank opposite and a little lower down stream.

This erosion is assisted by the fact that there is a natural lack of uniformity of soil materials forming the banks, and the friable sand or earth yields more easily than does a rock or clay formation.

The centrifugal force of the current will be thrown over to the concave side of the river channel, exerting greater pressure there, threatening to break any dyke protection, and by scouring and deepening the channel immediately under the bank, undermining the pile or rock facing under water.

In China these causes are particularly noticeable, partly owing to the immense volume of water in the main Chinese rivers, and the extreme rapidity with which they rise, and also on account of the fact that the lower courses of these rivers are for the most part through strata which is easily eroded, and where stone or rock facing work is not easily obtainable.

Moreover, the flooding of rivers in China has very often the reverse effect of that of the Nile or the Ganges, and instead of a deposit of alluvial soil when the flood recedes there is left behind a stretch of sand which ruins the agricultural possibilities of the area of a generation.



*Dyke Construction:—Light Timber and Earth Protection
(Yung Ting River, China)*

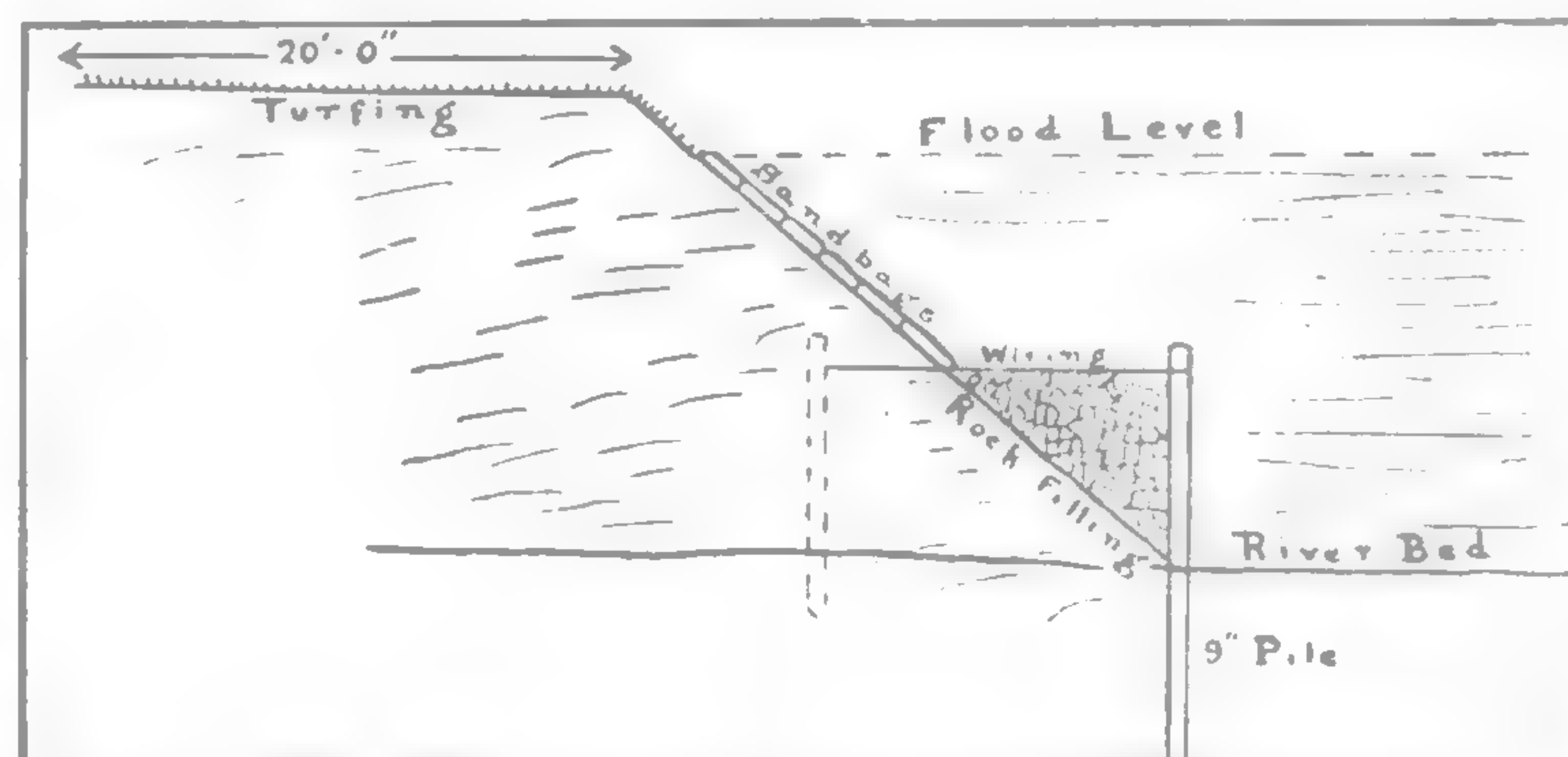
working and less dangerous to the community than they are at the present time.

Practically every year there is considerable loss of life and an enormous loss of land and foodstuffs owing to one of the chief rivers of China breaking its banks and flooding the surrounding country.

Therefore it is the intention of this article, first, to analyse the causes of this recurrent destruction, and second, to consider what ameliorative measures can be employed.

The prime causes which lead to a river overflowing its banks are to be found in exceptionally heavy rainfall or the sudden melting of snow or ice in the mountainous regions of its watershed, and in some cases this flooding has even been of a beneficial nature, owing to the fact that alluvial matter has been brought down by the current and deposited on the plains bordering the river.

This beneficent effect is naturally dependant on the velocity of the current, which, if too rapid, owing to the mountainous region



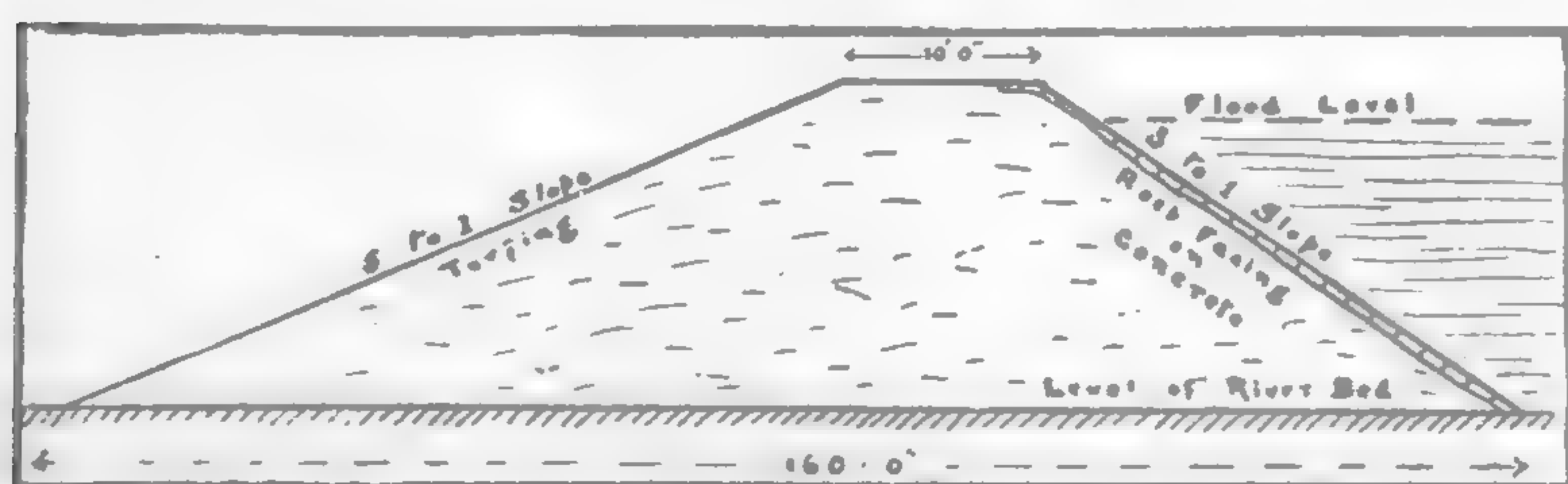
*Dyke Construction:—Earth and Turfing with Sandbag and Rock Protection
(American & Holland)*

It is particularly noticeable in Chinese rivers also, that while erosion is taking place on the concave side, accretion is taking place on the convex, and this is almost invariably of a sandy and impoverished character.

Having regard to these facts, it can be accepted as an axiom that river conservancy is a vital necessity in almost all navigable Chinese rivers, and it only remains to consider the most economical and efficient methods.

To train a river to its course it is advisable to commence operations as near the source as possible, that is to say, as soon as the river leaves the mountainous region where its channel is defined by natural barriers of rock.

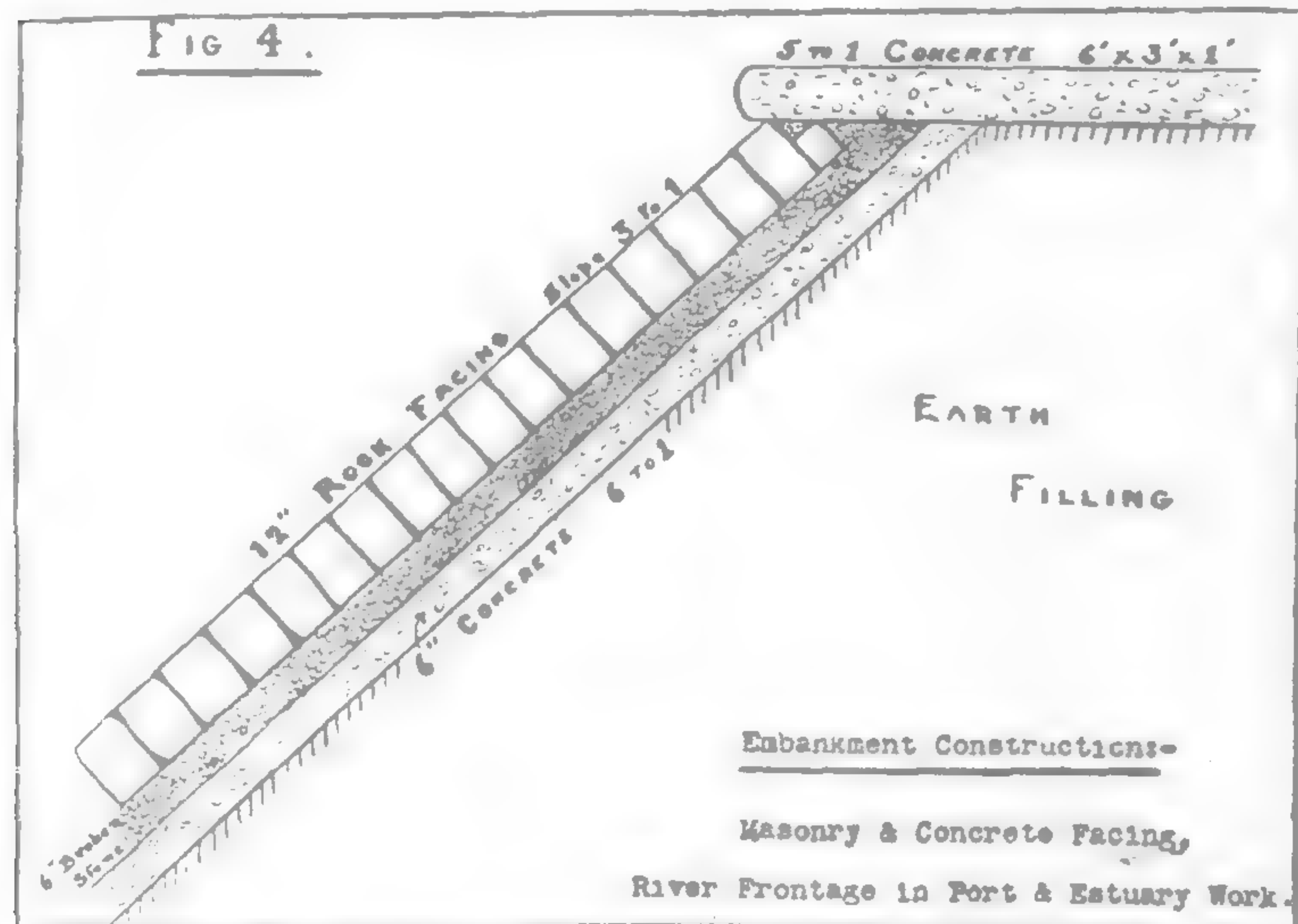
For a comparatively small flow, the light timber and earth dyke as outlined in Fig. 1 will be found to be sufficient, and many slight variations on this design can be made, according to the materials available on the spot.



*Dyke Construction:—Earth and Masonry Protection
(Han River, China)*

Brushwood mattresses were used instead of timber facing in the work which we carried out on the Yung Ting river, Chihli Province, and in Hupeh on the Han river, we found bamboo work satisfactory, though I am not certain as to its lasting qualities.

A slope of $1\frac{1}{2}$ to 1 is the maximum allowable, as even then there is a liability to slide, and for an outer slope 3 to 1 is usually advised, giving good foundation stability, and allowing turf to grow satisfactorily.



Embankment Construction:—Masonry and Concrete Facing, River Frontage in Port and Estuary Work

As the volume of water increases, probably some hundred miles or so from the source, the nature of the dyke protection will change, a stronger type, as in Fig. 2 becoming necessary. Fig. 3 gives a sketch of dyke work on the Han river, the toe of the embankment being protected by rock filling behind piles, these having a penetration of from 10 to 18-ft., and being wired back to a series of retaining piles in the dyke itself.

Sandbags can be used as a temporary protection in an emergency, but should be replaced by rock as soon as possible, while turf is only satisfactory at a point above high water, as it is apt to die if submerged for any length of time.

In cases where erosion has already taken place, a training wall or permeable dykes can be used, as illustrated in Fig. 5 the wall serving to direct the course of the current, while not offering a direct obstacle to it, and the permeable dykes retarding the flow of the stream and causing it to deposit the sand, gravel, or earth which it is holding in suspension.

Spur dykes are also of service in directing the stream, but when used in series it should be remembered that the distance between them should not exceed their own length, and that the last of a series should not be placed at such an angle to the current as to form an eddy behind it.

These two facts are usually neglected in practice in China, and the results are most destructive, erosion taking place with extreme rapidity.

A grave difficulty arises in some parts of China from the fact that rock or other suitable materials are not available in large quantities, and that sand has to be used very considerably.

The practice in Holland and Denmark in such cases is to use various kinds of marsh grasses, such as "starr" or "marram" grass, planted in twelve inch sods about two feet apart, and these in the course of a few years form an impenetrable mattress, binding the sand together and obviating the danger of shifting sandbanks which is so prevalent and so difficult to reckon with.

In cases where the bank has already been destroyed, and it is therefore necessary to carry out work under water, the following may be found to be satisfactory in its results.

If the bottom is weak a layer of brush or fascine mattresses should be first sunk, and upon this are raised two longitudinal banks of narrower mattresses, one on the land side and one on the river side, at such distance apart as to be included in the width of the

original bank, and each layer retiring inwards from the one below.

These mattresses should be weighted with rock if available to prevent shifting while in course of construction, and when the bank is satisfactorily aligned by these means, the heart can be filled in with earth or other material, until the whole is completed.

These constructions, as above outlined, will be found sufficient for most needs, but in the case of work in an estuary or a port it will be desirable to strengthen the dyke in some such manner as shown in Fig. 4 in order that the wash created by considerable navigation shall not destroy the banks.

In Holland and in England the practice is to support the toe of the embankment with sheet piling and rock rubble, while the concrete facing is laid on twelve inches of clay or broken brick to avoid subsidence.

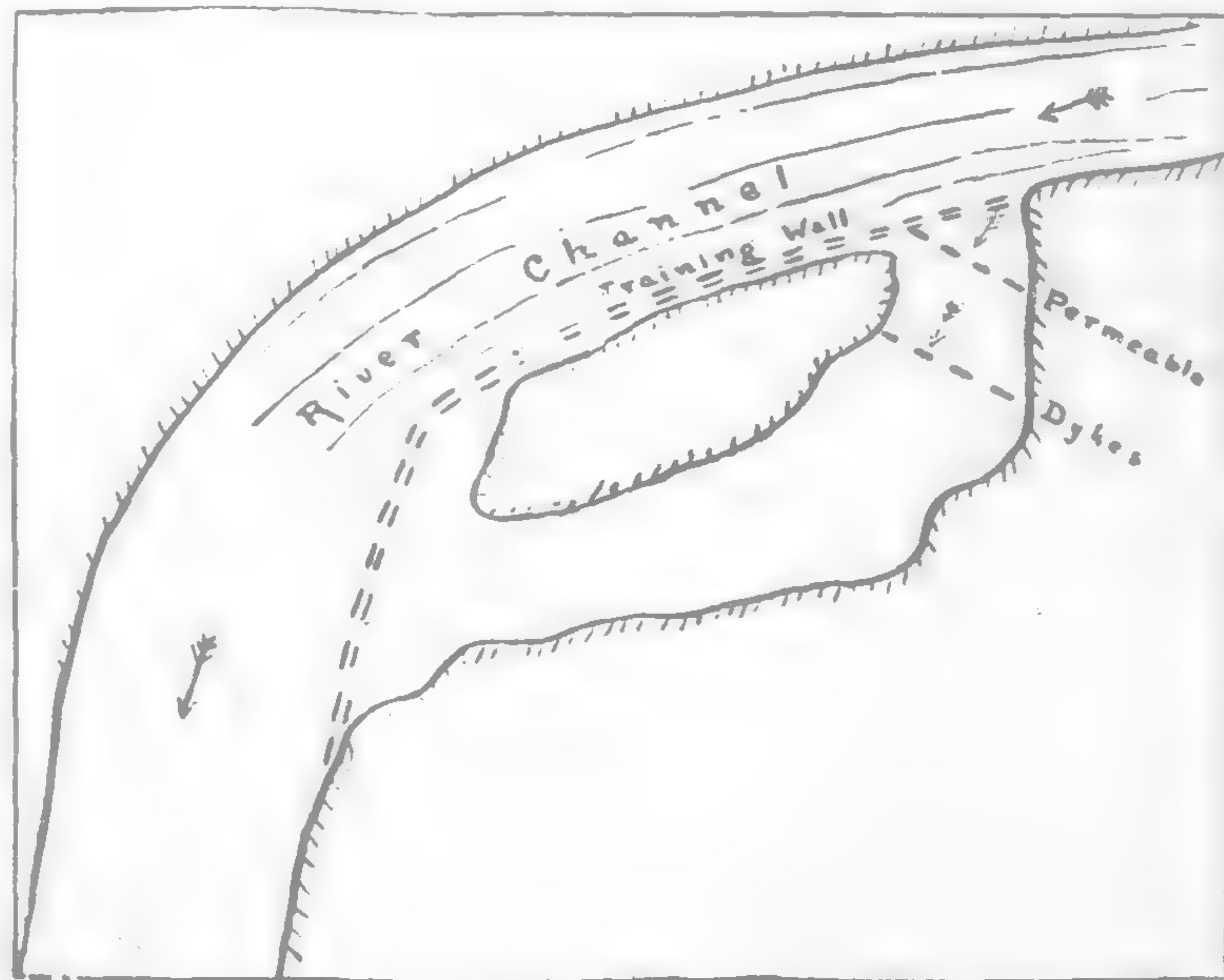
There is some difference of opinion as to the respective value of vertical walls as opposed to sloping ones, engineers arguing that (1) in a vertical wall the stones, being laid directly upon one another, they mutually assist in rebutting the thrust of the water, and that the danger of sliding is avoided.

(2) That the scour at the base of a sloping wall is considerably increased.

Actual practice appears to use the two types of construction about equally, and economy would dictate the use of the sloping wall as requiring less material for the same area.

It is necessary to consider next the fact that although the banks may be adequately protected, the results are of little comparative value to navigation unless the channel of the river be kept clear also, and this in China is a matter of some difficulty owing to the amount of sand deposited on the bottom in innumerable bars and banks.

An increase in velocity owing to the straightening of the channel will scour some of this deposit, but in the main channel of the larger rivers it will be almost inevitable that dredgers should be employed.



River Erosion:—Use of Training Wall and Permeable Dykes

This is an expensive item in conservancy, but in view of the value of navigable rivers to China it seems to be unavoidable, and once the initial cost is met the annual outlay will not be very considerable in comparison to that necessitated by embankment construction on a large scale.

In conclusion, I would urge the reader once again to consider the scarcity of good roads in China, the small extent of her railways in comparison to the territory to be covered, and the lack of direction of those that do exist, and the conclusion will be that the rivers of China are of the utmost importance to her commercial welfare, and agricultural prosperity, and that without a well considered scheme of conservancy they must inevitably fail to attain to that utility for which they are fitted and intended.

LAWRENCE IMPEY.



Canton Electric Light Plant: Diesel Engine Room

The Canton Electric Light Plant

By Tse Tsok Kai, Director of the Kwantung Electric Supply Company

PRIOR to 1909 the electric lighting plant was operated under a European concern with an exclusive franchise of 30 years for supplying the city of Canton with light and power. It was repurchased by the Chinese in 1909.

At that time the plant consisted of 4 175 h.p. condensing compound steam engines with 4 200 h.p. water-tube boilers complete with economizers and induced draft fans, and 3,200 h.p., 1,300 h.p. and 2,500 h.p., 4-cycle direct connected Diesel sets were added from time to time. The last addition was completed at the end of 1915, and consisted of the 2,500 h.p. sets. There were nineteen single-phase distribution feeders in all. The switchboard system is of very old type. The generator panels are located at one end of the switchboard gallery, feeder panels at the other and a "plug type" transfer board between, which is so arranged that by means of double pole air break plug switches, any of the feeders can be connected to any one of the generating sets. The units are not operated in parallel, each being independent of the other. The air compressors on all the Diesels are

pipied up to one another for convenience and it has been found in many instances that this arrangement has helped especially during the last three years when every machine had to run during the week with a heavy overload.



A 500 H.P. Diesel Engine

Some of the small Diesel sets though old have given very useful service. For fully five years due to the constant demand which because of the war could not be relieved, none of these machines have had a thorough overhauling. At 6 p.m. daily every set had to be running otherwise some section of the city would go without light. A 300 h.p. Hick Hargraves set ran continuously night and day for fully two years perhaps with no more than 12 hours shut down in a whole week. During five years exactly five long shut downs happened to the Diesels, in each instance the shaft being damaged, due to either piston head studs breaking or connecting rod brass bolts shearing. Interruptions due to cracked valves or fracture of small copper oil tubing occurred at intervals. To improve these conditions it was decided to install a new turbine plant and this has been in successful operation for the past five months.

The new turbine plant located adjacent to the Diesel plant, was designed for an ultimate capacity of 30,000 k.w.

The present installation consists of equipment for two 2,300 volts, 60 cycles, 3 phase, 2,500 k.w. at 80 per cent. P. F., G. E. Curtis steam turbine sets. The steam pressure at the throttle is 215-lbs. with 1,500 F. superheat. At the end of the turbine room are located the switchboard and electrical equipment. The electrical galleries are five stories high. In the basement the oil circuit breaker cells with sectionalized busses, are located. These cells are of concrete and arranged in groups of four. The first floor is for switch cells for future extension. On the second floor are installed two 50 k.w. exciters, one motor and one steam driven. On the third floor is located the switchboard proper. The switchboard is of bench type, with electrically operated remote control and furnished with the latest electrical equipment. Ample room is left in this floor for future extension. The fourth floor is for voltage regulators and the fifth for G. E. aluminium lightning arresters and choke coils. At present there are nine outgoing feeders all three phase. The feeders leave the building on the fifth floor wall through bushings. All control wiring and outgoing feeders within the building are laid in steel conduits. When the switchboard was laid out, it had special reference to the future requirement of the plant and is, therefore, essentially different from an arrangement as would be designed for the present installation.

In the turbine room are also located two Worthington feather valve, horizontal crank and flywheel, steam driven, rotary dry vacuum pumps, one for each turbine, besides the engine room instruments and the overhead 25-ton motor-driven crane.

Underneath the turbine room is the condenser basement where 29,000 sq. ft. effective cooling surface Worthington surface con-

densers are connected to the turbines through corrugated copper expansion joints.

The boiler room runs adjacent to and parallel with the turbine room by a door at the gang plank gallery. The condenser basement is inter-connected. In the boiler room there are 4 750 h.p. Stirling boilers with steel casing and two turbine-driven boiler feed pumps. The four boilers are arranged in two batteries facing each other. Each boiler is equipped with one B. and W. superheater, one special 8-in. Lagonda automatic steam stop and check valve which has

an extended spindle and handwheel so it can be operated from the boiler room floor. Each boiler is also provided with a Cope's automatic feed water regulator and two blow-off valves. Boiler steam pressure is 225-lbs. per sq. in. with 150° F. superheat.

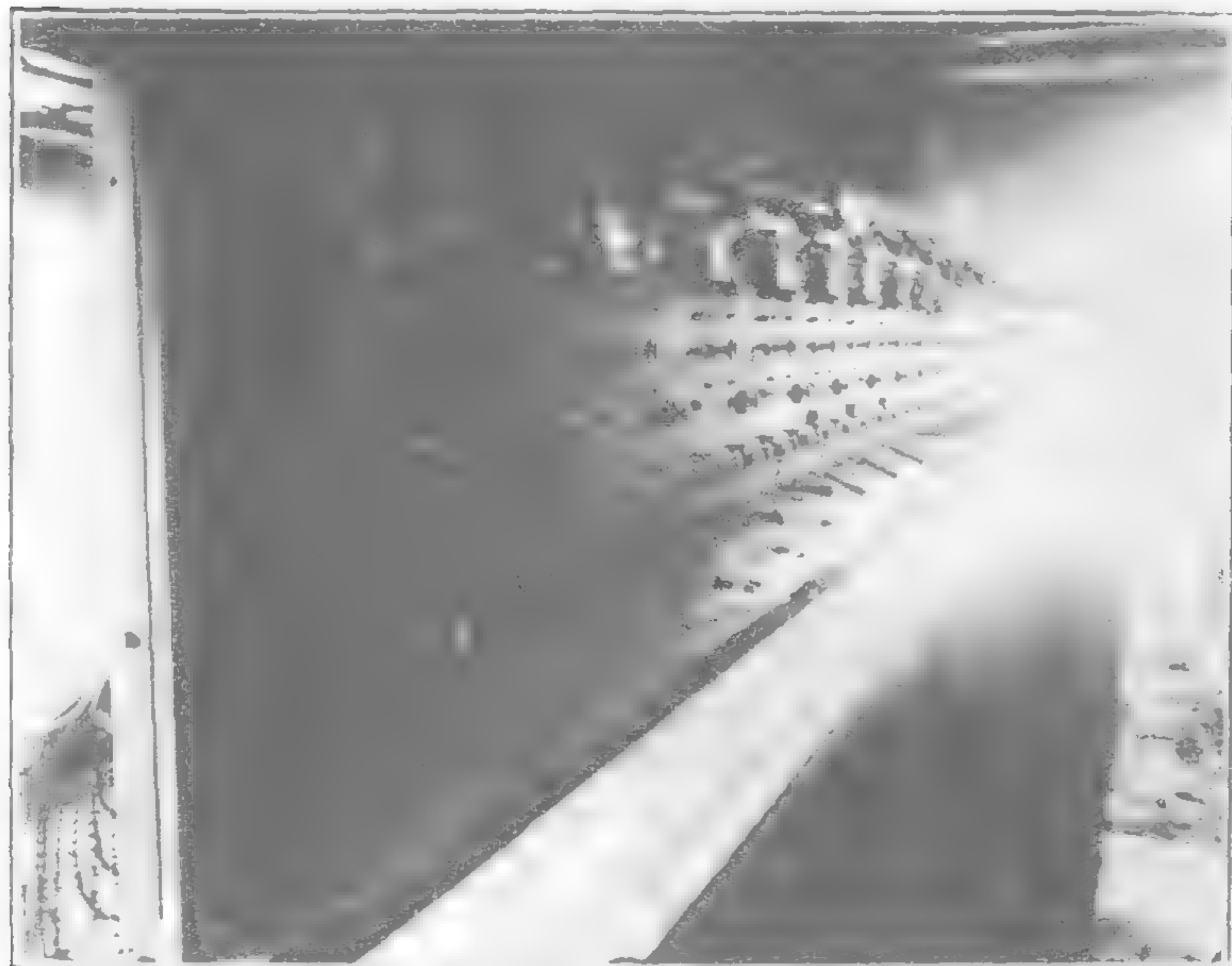
The furnaces were designed to take care of low-grade bituminous coal and are of the Dutch over extension type extending about 6-ft. in front of the boilers and being 9-ft. deep.

As the coal bunker is not installed at present, coal is carried into the station by coolies and lifted up to the boiler hoppers by the same hoist as that used for removing the ashes.

The building is of reinforced concrete throughout, with steel window frames and wire mesh glass panes. The pilasters are of reinforced concrete up to the condenser and boiler room floors from these points steel columns are used in order to save space. The roof is a 3-in. concrete slab with steel roof trusses. Glass is used on all 4 sides, so that the building is very bright inside, and large hinged windows provide sufficient air circulation. Additional ventilation is provided in both turbine and boiler rooms by louvres in the roofs. All floors are designed to stand a load of 300-lbs. per sq. ft. and are carried on I-beams. The floors are reinforced concrete, 6-in. thick.



A 500 H.P. Diesel Engine, with Ingersoll Rand Compressor



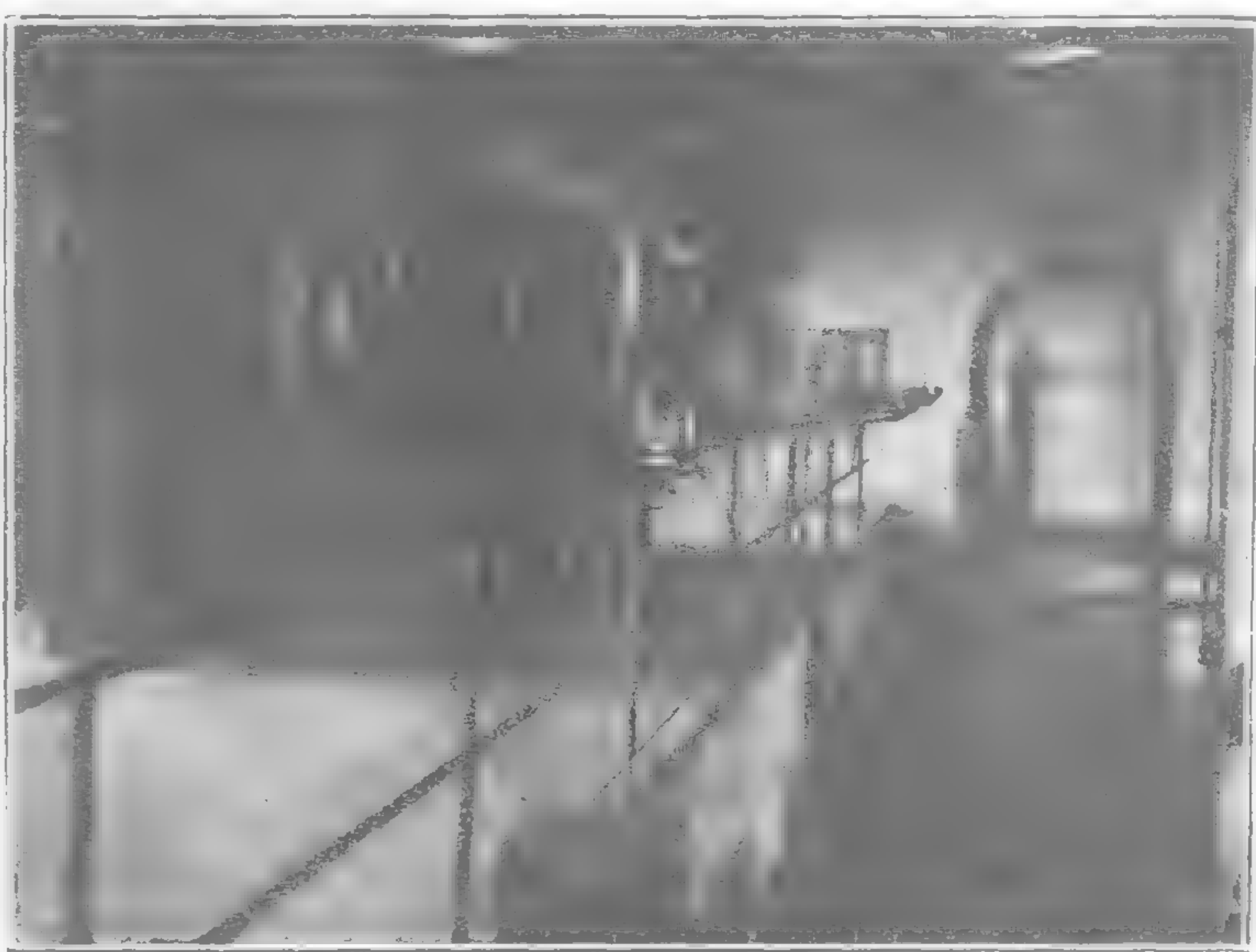
Engine Panels for the Diesel Plant



Plug Board for Diesel Plant



Switchboard for New Turbine Plant in Canton Electric Light and Power House



In the construction of the power plant the greatest difficulty encountered was in the circulating water system for the condenser plants. This, of course, like the rest of the power plant, was designed for an ultimate capacity of 30,000 k.w. The nature of the ground at the plant location is porous due to it being reclaimed ground, the filling having taken place over a period of many years.

To complete the river end of this job it was necessary to put down a cofferdam, and although this served the purpose to a limited extent, eventually divers had to be employed to finish up the excavation and concrete work. The bed of the river was a mass of huge boulders, some weighing as much as four tons while the majority were between 300 and 400-lbs. With such a bottom it seemed nearly impossible to keep the water out. The original intention to pump the water out of the cofferdam and do the excavation and concrete work in the dry, was found to be possible only during low water and fortunately this condition existed until the screen house was completed, but with the rainy season coming on and the continued high water it was impossible to keep the water down when discharging water from the cofferdam at the rate of 10,000 gals. per min., so it was decided to give up the attempt and use other methods.

Divers were then employed and the excavation for the connecting tunnel was completed under water. This was followed by pouring an auxiliary concrete slab under water. The sides of the tunnel were then made in three foot sections with tongue and groove joints, these being made of concrete above the water with the reinforcing iron protruding at right angles, at the top and bottom of each section. These large blocks of concrete were then lowered to the bottom and were set in position by divers under the water and the reinforcing iron connected across at the bottom to opposite sections. The permanent concrete bottom of the tunnel was then poured under water and allowed to set. The pumps were then started up and the water brought down to within four feet of the bottom, and it was kept at this point while the forms for the top were put in place, the reinforcing iron connected across and the concrete poured. When finished the tunnel was an excellent job.

The reason for going down so deep with the intake water tunnel was due to the rise and fall of the river, which has a variation at different seasons of about 13 feet. The condenser plant was designed to operate on the syphon principle, and the discharge water tunnel was run on the top of the intake water tunnel. A water lock was provided in the discharge water tunnel to seal the discharge pipes from the condensers to keep the construction costs down. Height of the syphon is 23-ft.

Although a little troublesome when started the plant is now giving every satisfaction. The completion of the circulating water system was the hardest job, indeed it is considered to have been the most difficult piece of river engineering ever attempted in South China.

The system when finished, is to consist of three-phase feeders with three single-phase feeder regulators on each circuit, and single-phase mains to which are connected large size line transformers. A three wire, grounded neutral secondary system, is used. For 80 per cent. of the load 25 K.V.A. pole type line transformers are found to be economical. Formerly the pole work done on ladders is now done on climbers.

As the local authorities allow balconies to be erected over the side walks on the 80-ft. wide streets, extending to the street curbing, poles have to be set in the streets and alley arms are resorted to so as to keep the poles as close as possible to the curb. On the 70-ft. wide streets the poles are placed in the side walk close to the curb with standard cross arms.

In order to connect some of the Diesel plant circuits to the turbine plant, a new transfer board was erected by which any of the single-phase circuits can be switched over to any one phase of the turbo generator. This is accomplished by using D.P.D.T. automatic hand operated oil circuit breakers.

The single-phase feeders are connected through disconnecting switches to centre poles of the oil circuit breakers. Two poles of the breaker are connected to the "plug" board for single-phase alternators and the other two poles to one phase of a three-phase bus, which is connected to the turbo plant. Thus by throwing the breaker one way the feeder could be connected to a single-phase alternator and throwing it the other way would connect it to the three-phase bus of the turbo plant. This board has made the working of the Diesel plant very flexible.

As to street lighting the multiple system is still being used in the narrow streets but on the broad streets, a system of series incandescent lamps of 40 watts, has been installed. There are about 600 of these lamps in use. The city is also planning for ornamental lighting at the street corners.

Before the new turbo plant was in operation, it was necessary to stop the connection of any new lights. As soon as these restrictions were removed, a large number of prospective consumers applied for current. In the second month following the removal of these restrictions 1,156 metre consumers were connected up, and over 300 flat rate consumers added. At present there are still over 600 applicants for metre connections every month. Contracts for supplying power to 250 h.p. in motors have been closed and about 300 h.p. to 400 h.p. are still under negotiation.

All the house installation work which formerly was entirely done by the company, is now executed by contractors licensed by the city after examination. There are about 60 such contractors. All wiring must comply with the city rules and regulations for wiring.

On account of increased demand for power, the company is asking tenders on a complete 5,000 k.w. equipment.

Japan's River Improvement Program

With Special Information on the Tonegawa Scheme

INNUMERABLE small rivers keep Japan a well-watered land, but for centuries these rivers have been the curse of the country sweeping over their banks in merciless floods inundating the surrounding fertile lands, and leaving behind barren wastes of sand and stone. In the old days no attempts were made to make these waste lands fertile again. The diversity of local governments placed the possibility

By this plan the central government undertook all work of improving river beds and courses, while the local governments (prefectural) were charged with the duty of preserving the river banks, and with building flood protection embankment works. From 1887 to 1895 under this plan, the central government budgeted Y.850,000 a year for construction, and during the total period a total of Y.6,724,209 was actually expended on the most necessary work.



The Yokotone River Water Gate

In 1896, a new law was promulgated, which placed the improvement of important rivers under the control of the department of home affairs; and provided that a part of the costs should be paid by the local governments interested.

The home department began the work of building up the banks of the Yodogawa, and the Chikugogawa. Under this law between 1896 and 1910, the Tone, Sho, Kuzuryu, Yodo, Shinano, Koryu, and Watarase rivers were all materially bettered. The total costs of all constructions during these years amounted to Y.11,641,698, an annual expenditure of Y.776,113.

of any alleviation of the intolerable conditions quite outside the realm of practicality. River embankments to hold back the floods were regularly erected by the feudal lords, and as regularly swept away next flood-time.

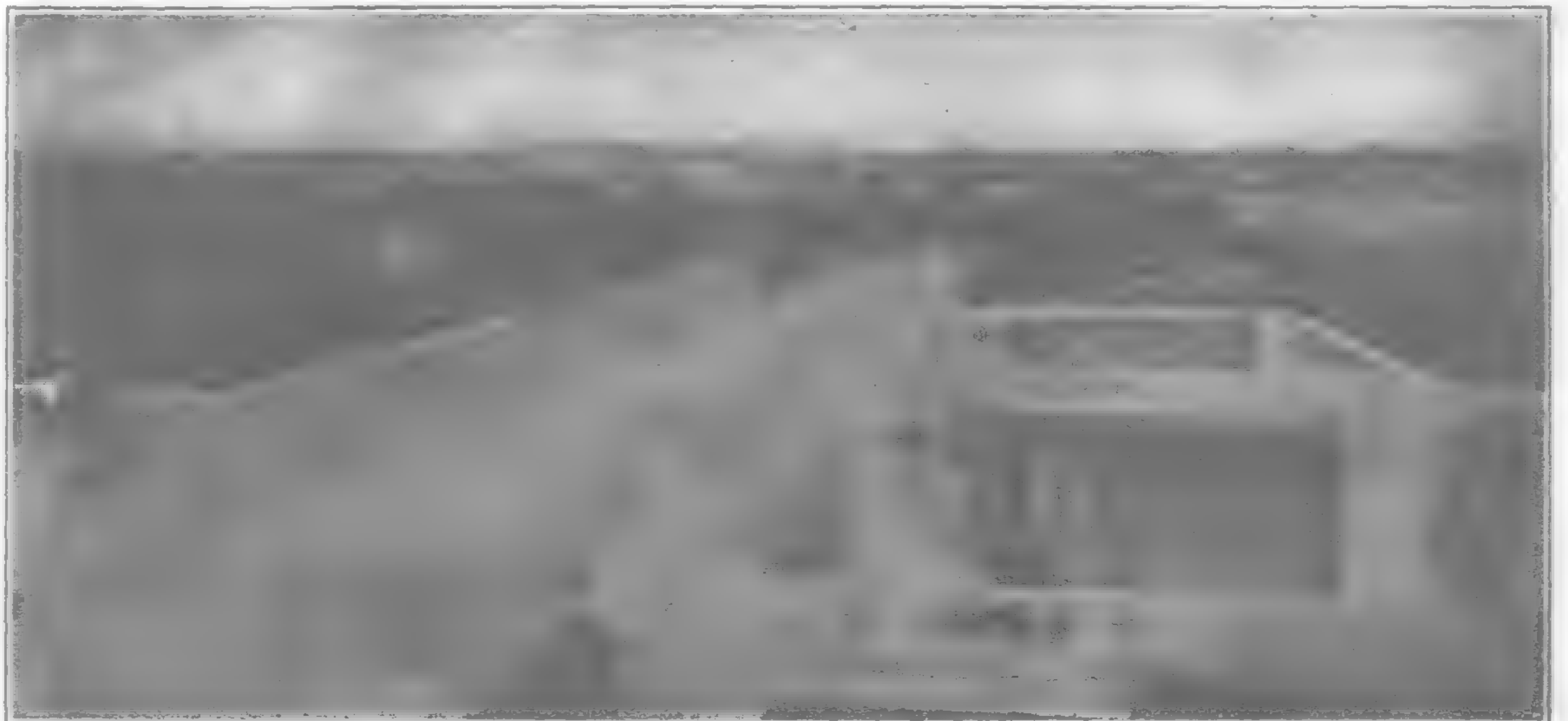
When the country was unified in 1868, the imperial government adopted a policy of national control of all river improvement work. The national treasury was unable, however, to bear the burden entailed, but within the limits of financial ability some work of constructive importance was regularly accomplished. The first river improved under the direct supervision of the central government was the Yodogawa, in 1873. This river is the most important inland waterway in the Kwansai district, and empties into Osaka bay outside the eastern part of the city of Osaka. Since 1873, what are known as the fourteen big rivers under direct control, the Tone, Shinano, Kiso, Kitakami, Sho, Abukuma, Fuji, Ayano, Mogami, Yoshino, Chikugo, Oi, and Tenryu rivers, have all been the objects of government activity. From 1873 to 1886 the central government expended a total of Y.3,086,328 on bank protection works, and in strengthening banks where the flood torrents were most likely to get out of control. No general plan covering the improvement of the internal waterways of the country as a system of inland transportation was prepared during this period, so that at best all the work done was more or less of a haphazard nature, and only for the most urgent purposes.

In 1886, the government adopted plans for the improvement of all rivers in Japan.

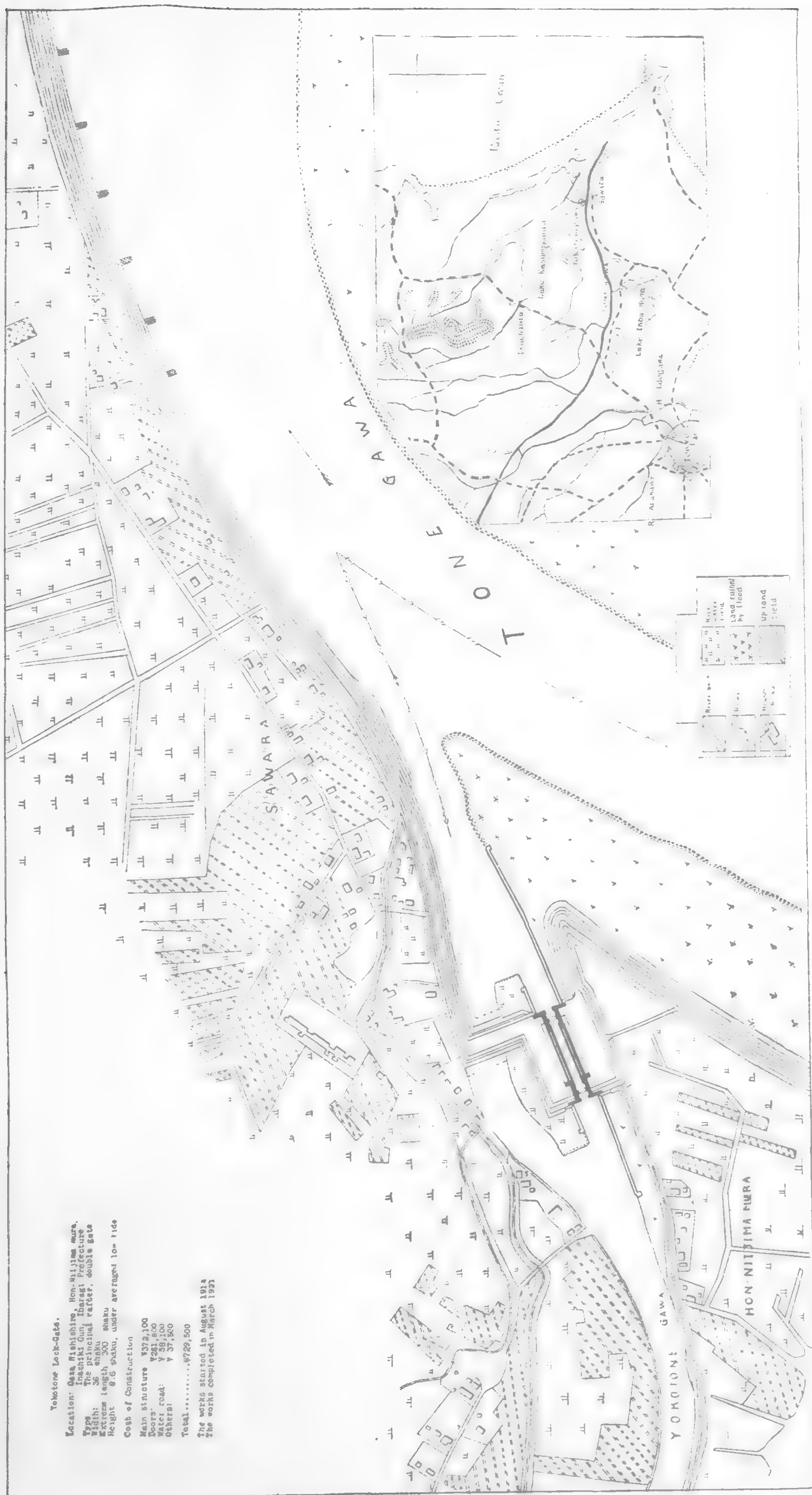
In 1910, the whole country was visited by disastrous floods and the government then established an "Extraordinary River Investigating Committee" to engage in an extensive survey of the rivers of Japan, so that a plan for the fundamental improvement of the intolerable flood conditions might be worked out. In 1911, the committee drew up a plan spread over a period of eighteen years calling for a total expenditure of Y.176,744,471, of which Y.135,757,974 was allowed by the diet from the imperial treasury. The balance of Y.40,986,497 was to be paid from prefectural government funds.

This plan provides for (1) direct improvement of rivers, and (2) the prevention of floods by reforestation of waste mountain lands.

At the time this plan was adopted there were nine rivers being improved: the Tone, Shinano, Sho, Kiso, Kuzuryu, Yodomi, Koryo, Yoshino and Onga. Including these, 65 rivers in all were selected to be the centre of the government's plans of improvement



The Inaba Water Gate



Map of the Tonegawa Improvements showing Yokotone Lock Gate and Relation of Scheme to Tokyo

and construction of inland transportation waterways. Construction was to be accomplished in two periods, and these nine rivers, together with 11 others, the Ara, Kitagami, Iwaki, Omono, Mogami, Agamno, Jin-tsu, Fuji, Kako, Hii, and En, were selected for the first period of construction work, at a cost estimated at Y.164,314,471.

The rivers included in the second construction period are the Abukuma, Tenryu, Chikugo, Naka, Naruse, Tama, Shonai, Yasaku, Naka, Yamato, Ki, Yabe, Sagami, Kuji, Ota, Yoshii, Ura, Maruyama Seki, Chiyo, Asahi, Yoneshiro, Go, Natori, Ashida, Sakawa, Tedor, Kikuchi, Suzuka, Watari, Kano, Niiyodo, Kawauchi, Kuma, Ota, of Hiroshima prefecture, Ono, Oyodo, Oita, Mabuchi, Kimozoku, Hiji, Tsurumi, Shira, and Aisaka.

Along with the improvements planned in the courses of these rivers, work for the prevention of sand drifting was to be carried out under the direct control of the home department. Such work might also be carried out by the prefectural governments, in which case, a proper subsidy was allowed from the national funds. The estimated costs of all these sand drifting prevention works is Y.12,430,000.

The plan was put into execution at once, but in 1913, largely due to the political unrest, the work for that year had to be postponed. Consequently the budget appropriations were extended to 1929, and the dates of completion of construction on each river extended one year also. Many additions to the original plans were adopted, thus causing further extensions in the time for construction.

By 1918, work had been commenced on the Ara, Kitagami, Agano, Omono, Mogami, Kako, Iwaki, and Jinzu rivers. But the rise of prices occasioned by the European war, caused a lack of funds, and there was a partial alteration in the budget of 1919, which was in part also necessary by the inclusion of certain most necessary changes in the amended plans. In 1919, a further Y.12,259,405 was added to the original estimate, and in 1920, another increase of Y.22,444,648

was allowed. The budget for river improvement as a consequence was altered to :

National Treasury account	Y.161,945,360
Local government account	48,503 164
Total	Y.210 448,524

The national government has confined its operations to work on the main streams of the most important rivers. Work on branch streams, or the upper waters of the principal rivers where navigation is not extensive has been left to the local authorities.

Many of the rivers included in the second period of construction, are frequently in flood, and cause great damage. The local

Aga, Abukuma, and Maruyama rivers. Construction in all these cases has been carried out under the direct supervision of the central government.

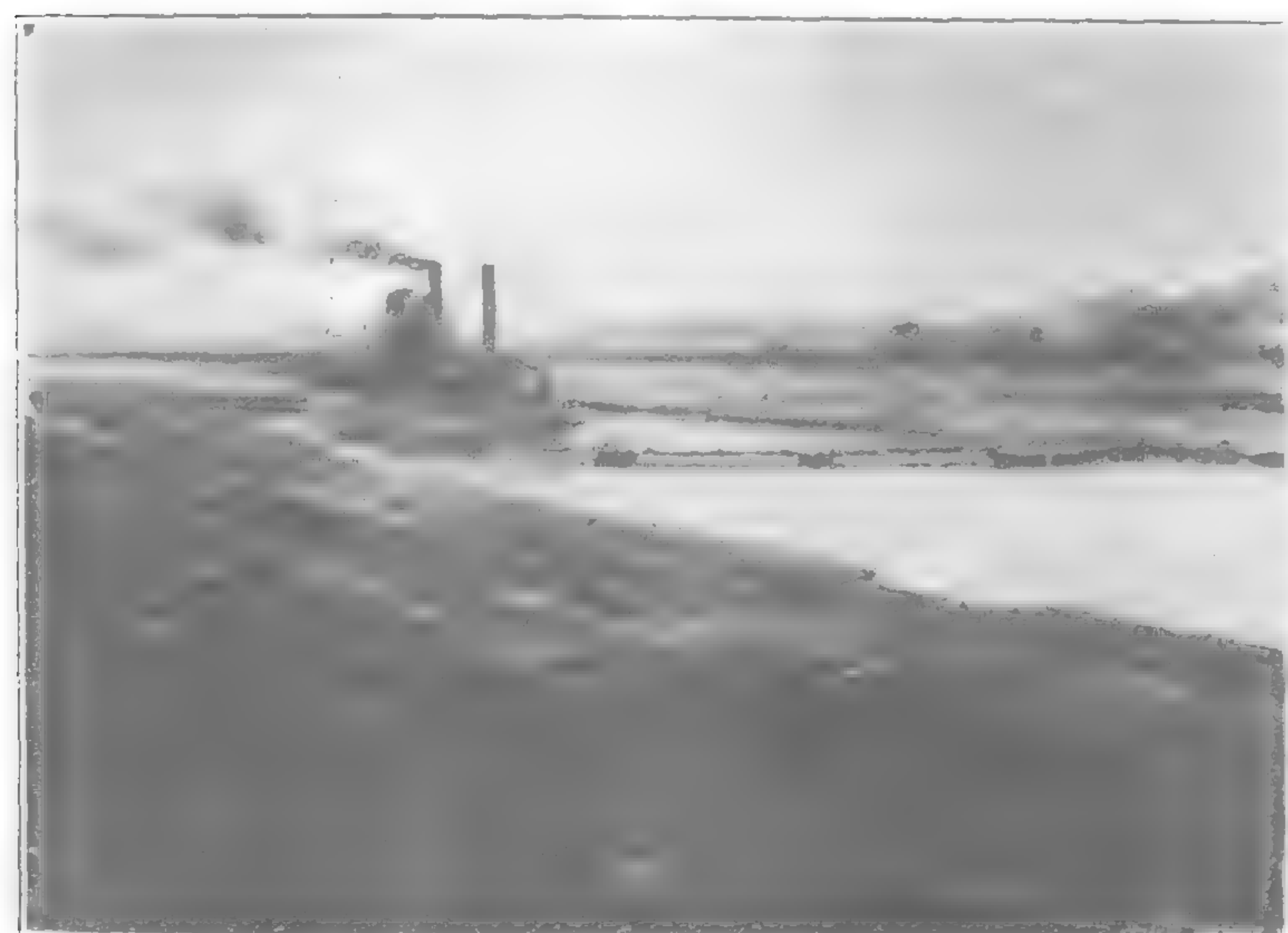
The works planned for the Yodo Gawa were completed. But disastrous floods in 1917 occasioned an extension of these operations. In 1918, a new program was adopted, for construction over a period of six years. Part of the expense is being met by the local authorities, the balance is defrayed by the national treasury. Funds for the subsidizing of river improvements amount to Y.50,-217,600. By 1933, the central government will have defrayed Y.26,370,600 on present authorized construction, and the balance of Y.23,847,000 will be paid by the local authorities.



Dredger "Banto"



Dredger "Inaba"



Dredger "Inashiki"



Dredger "Taka"

The Tone River Improvements: Types of Dredges used on the Work

governments were clamorous for immediate improvement of these conditions, and urged national subsidies. The government decided to allow, therefore, subsidies for fundamental important work on the branch or upper streams of the rivers in the first period work, and for improvements on the main streams of the rivers in the second period, when they are rivers which flow through important agricultural districts whose protection is important to the national food supply. The home minister has also been authorized to undertake urgent works not already provided for by law when it is a matter of public necessity. In 1917, the first subsidy under this decision was given to work on the Eai and Naruse rivers, located in Miyagi prefecture; the amount being half the total cost of construction. Since 1917, subsidies of half the costs of construction have been granted to works on the Chikuma, Tama, Ota,

All river improvement work in Japan is accordingly a joint work of the local and national authorities. For the time being it is principally directed to putting a stop to the intolerable flood conditions, and the disastrous drifting of sand along the courses of rivers which have already laid waste thousands of acres of fertile agricultural lands.

The Tonegawa which flows to the north of the city of Tokyo from the mountains in Gunma prefecture into the Pacific Ocean at Choshi in Choiba prefecture is one of the most important waterways of eastern Japan. The works planned for the bettering of transportation conditions on this river and for preventing damage from floods are described below.

The Tonegawa with its tributaries and its branches drains a basin of 2,550 sq. miles, embraced in seven prefectures of eastern

Japan. Though the Tonegawa itself is only 205 miles long, the total length of all its tributary streams is 2,800 miles. Flat bottom Japanese boats are able to navigate the main stream for a distance of 175 miles from the mouth of the river at Choshi in Chiba prefecture on the Pacific Ocean, but only 2/11ths of the length of all the streams are navigable even in these boats.

The river is of the greatest importance to the city of Tokyo for it is along its waters that the produce of the districts to the north and northwest of the city are carried to its markets. The Edogawa (Edo is the old name of Tokyo), a branch of the Tonegawa, connects the capital with the parent stream.

Flowing through low lying plains the surrounding country lies only a few feet above the ordinary high water level of the river.

tance of controlling the flood waters of this river has been recognized, especially as a flood beyond control in the upper stream of the Gongendo river, a branch of the Tamagawa, would cause a direct inundation of Tokyo city.

The plan for controlling the flood waters of the Tonegawa was adopted in 1890, the works to be completed in 24 years. Originally, Y.52,380,444 was appropriated for construction, but because of the rising costs of materials and labor in recent years, an additional Y.11,078,884 was later granted. With these sums improvements in the river bed, embankments, and flow were to be effected at the three most important places along its banks.

The districts where improvements were necessary are—

1. The Tamagawa: from Shibane-mura, Sawo-gun, Gunma



Marion Steam Shovel at Work



Digging Machines, at Nakada, Ibariki Prefecture



Suction Dredge "Chiba"



Dirt Train Unloading

Tone River Improvements: Modern Mechanical Shovels,

Diggers, Suction Dredges, etc., employed on the Work

During the rainy seasons in June and September and early in August, when the mountain streams are swollen by the melting snows, the Tonegawa and its branches invariably overflow their banks and cause great damage.

The annual damage caused by floods along the main stream, to agricultural products and the embankment works amounts to more than Y.8,000,000. It is difficult to estimate the damage done indirectly by the tie-up of communications, commerce, and the unsanitary conditions resulting from the floods. Great floods of the Tonegawa are said to occur once in every ten years, at least. But as a matter of fact in recent years they have been much more frequent. Since 1890 there have been eight great floods, causing damages of more than Y.15,000,000. For many years the impor-

prefecture, to the town of Choshi, Chiba prefecture;

2. The Edogawa: from Sekijuku-machi, Higashi Katsushika-gun, Chiba prefecture, to Gyokuto-machi, same prefecture, a distance of 37½ miles.

3. The Nakagawa: from Matsubuseryo-machi, Kita Katsushika-gun, Saitama prefecture, to Honda-mura, Minami Katsushika-gun, Tokyo prefecture, a distance of 15 miles.

The problem of control was principally one of deeper and wider river beds which would effectively carry away the flood streams before the embankments could be flooded. Consequently it was planned to effect a change in the bed of the Tonegawa between Shibane-mura and Sekijuku where the Edogawa branches from it, so that a flow of 200,000 cu. ft. per second would not endanger the

surrounding country. The flow into the Edogawa was to be increased to 80,000 cu. ft. per second. Between the Edogawa and the point where the Kinugawa empties into the Tonegawa the flow was to be increased to 120,000 cu. ft. per second, and from the Kinugawa mouth to the sea, the flow was to be made 155,000 cu. ft. per second.

In order to effect these changes the main stream of the river had to be widened to 1,800 feet, but at Akaiwa, for some two miles, an additional 1,200 feet outside the main river bed has been constructed to carry any overflow that the main stream cannot bear during flood times. The bank of the main stream at all points was to be 6 feet higher than the highest recorded flood levels, except at

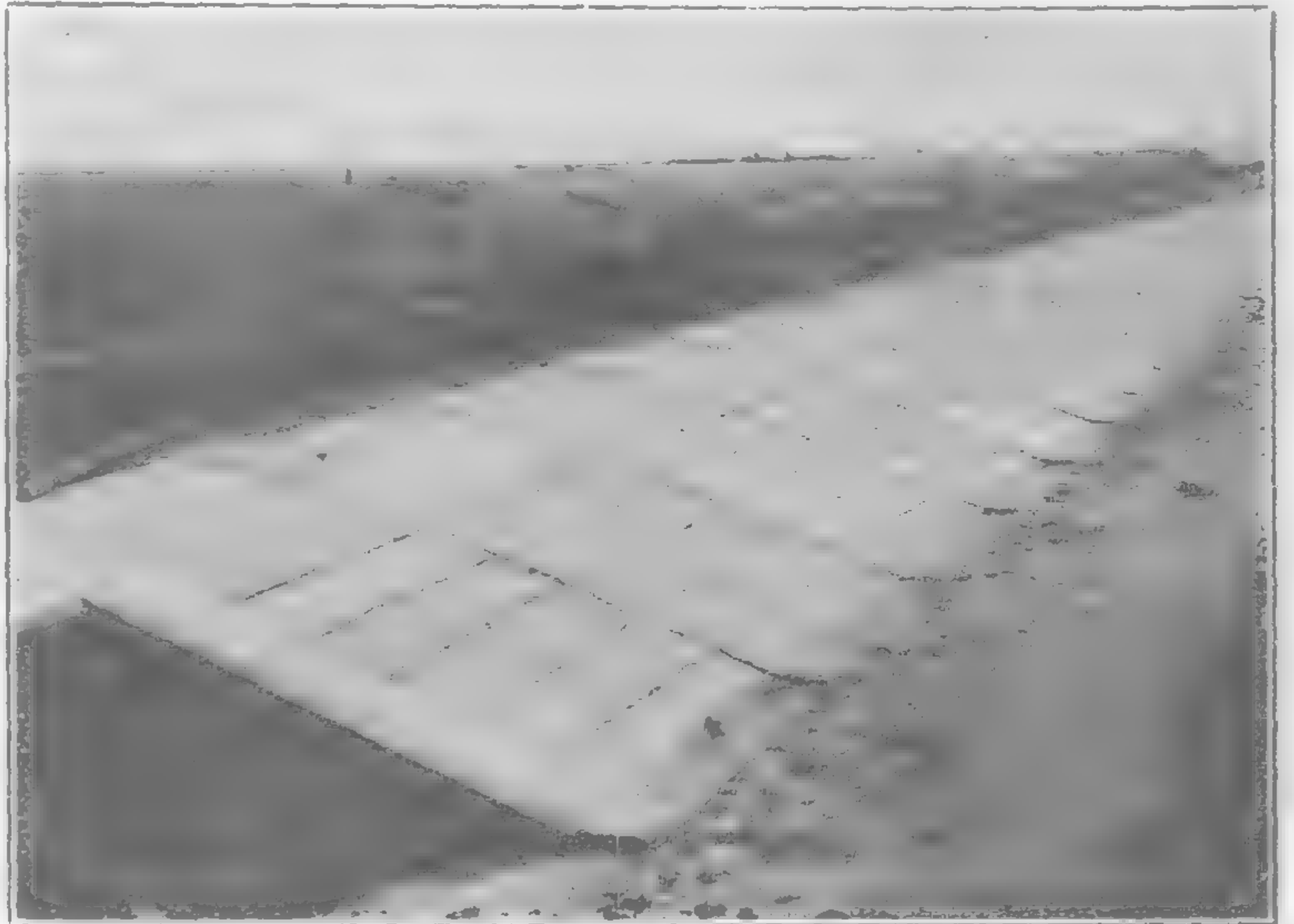
Second period: From Sawara-machi to Totte-machi, Kita Soma-gun, Ibaraki prefecture, 32½ miles.

Third period: From Totte-machi to Shobane-mura, Sado-gun, Gunma prefecture, 68½ miles.

At Sawara-machi, the Tonegawa suddenly turns to the north for about 2½ miles, and there the river bed is extremely narrow and shallow, so much so in fact that the flood tide of the river cannot pass up stream. Consequently it has always flowed back to the Yokotone river and through it pours into the lagoons, Kasumiga Ura, Kita Ura, and Sakanami Ura, causing serious damage on its way. This was the first period work, and construction was completed in 1909. A new channel has been dug by straightening the sharp



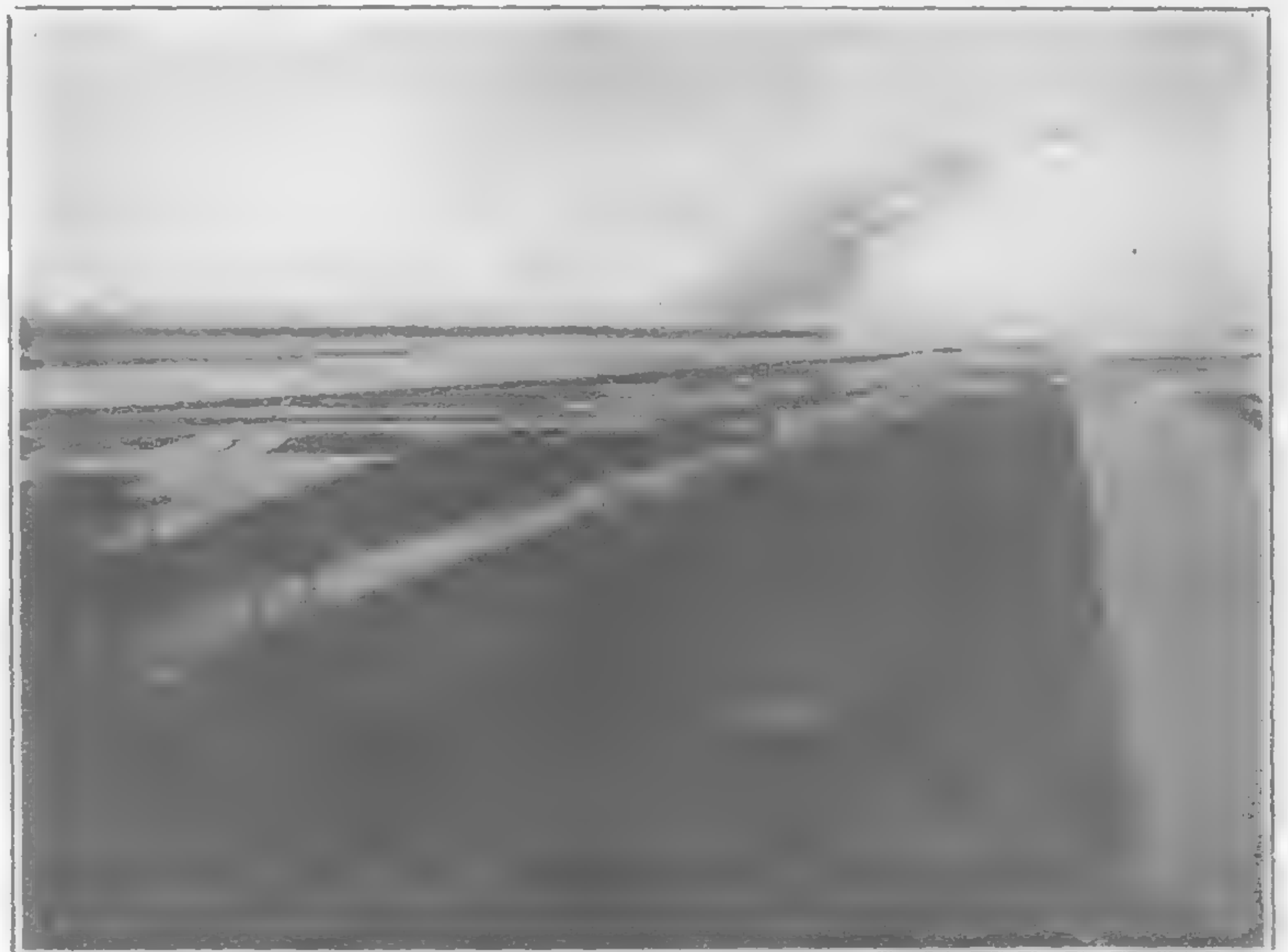
Fukugawa Water Gate under Construction (March 1921)



Embankment at Gytoku New Water Channel



Embankment at Fusa (May 1921)



Protection Work at the Junction of the Kinu and Tone Rivers (Apr. 1919)

Tone River Improvements

Aikawa district where they were to be raised only 5 feet. Where the Watarasegawa meets the Tonegawa a great ditch is being constructed to carry off flood waters between Koga and Fujioka, where flood damages have always been particularly severe.

Between the entrance of the Kinugawa and Totte-machi, a distance of 7½ miles, the river was widened to 2,200 feet, and a ditch to carry sudden flood increases is being constructed on either side of the main stream. From Sawara-machi to the sea the width is gradually increased to 3,000 feet at the mouth of the river at Choshi.

For financial and engineering reasons the work was divided into periods.

First period: From Sawara-machi, Katori-gun, Chiba prefecture, to the sea (at Choshi), 26½ miles.

turns in the river, and by deepening and widening its bed.

SECOND PERIOD.

Between Totte and Sawara the width of the river was to be increased to 1,800 feet, but between the two towns of Munokawa and Nunose the river is so narrow that it was impossible to widen it. The bed was accordingly dredged and a very deep channel constructed so that a maximum flow of water would carry off all the floods. Between Takaoka and Sawara the river has always been changing its bed, and it was determined to remedy this by constructing a new artificial channel in a straight line between the two towns, which would cross the bed of the old river.

The Shogengawa, one of the branches of the Tonegawa, was controlled by building a water gate at its outlet. This prevents

any back flowing, and at the same time periodic floods of the banks of the lagoons, Inbanuma and Teganuma, are done away with by the absolute control of the stream by the water gate. The Yokotone river was also controlled by a water gate, so that the inflow of water to the Kasumiga Ura lagoon was stopped.

THIRD PERIOD.

Between Shibane and Totte, the Gongendogawa is to be shut off from the Tonegawa and water pipes will be placed there to carry off the water supply to Tokyo. The Kinugawa meets the Tonegawa at an angle of 90 degrees, and to better its flow it will be deepened. The Yokotonegawa which meets the Tonegawa opposite the town of Sawara is to be controlled by a 36 feet wide water gate, preventing flood waters from entering lagoons. Communication between the Tonegawa and the lagoons will not be interfered with by this water-gate, as locks are being built to handle the traffic. The outlets of the lagoons, which meet the Tonegawa to the south of the Omigawa, are all to be closed, and an artificial channel will be constructed to a point on the Tonegawa at Tachibana-mura, thus effecting a lowering of the water level of the lagoons and release many acres of valuable land for agricultural purposes.

THE EDOGAWA

Navigation of the Edogawa which connects Tokyo with the Tonegawa is extremely important and so that it may not be interrupted even in times of flood, a new channel is to be dug at Sanno in Goko-mura. The entrance to the new channel will be 930 feet wide, and the flow will be controlled by eight water gates, each 25 feet wide. A ditch 30 feet wide is being constructed along the right bank of the river, and this will be used to carry off any flood waters. From Gyotoku the channel is very tortuous, and this is being straightened out. From Sekijuku this river is to be 840 feet wide, until it reaches the river mouth where it is to be 1,320 feet wide.

Construction of these works is almost completed, and will be finished in 1923. At the end of 1921, the actual state of construction was as follows:

Work Planned: Total cost of construction, Y.52,380,448; additional cost approved, Y.11,078,884; total Y.63,459,332; completed, Y.48,938,698; 75 per cent: quantity of earth used for building new embankments: total, 10,554,007 *tsubo*; completed, 9,612,673 *tsubo*, including 6,186,695 *tsubo* of earth dredged: 88 per cent., dredging and excavating, area: total 16,895,962 *tsubo*; completed 15,854,864 *tsubo*; 90 per cent. Length of embankments completed, 275 miles; embankments for regulating flood streams: total, 137,155 *ken*; completed, 69,883 *ken*; 60 per cent. Special water gates: total 20; completed, 14. Bridges: for carrying water pipe, over main stream, etc.: total, 190; completed, 186 places. Land purchased total scheme, 7,609 *cho*; actually purchased, 6,606 *cho*. Buildings to be removed covering 199,758 *tsubo*; completed, 235,078 *tsubo*. Although work done exceeds estimate, there still remain some buildings to be removed in Matsuod and Ichikawa districts. Cost of construction to March 31, 1922: Y.48,938,698.32.

In carrying out the improvements many millions of yen have been expended in the most modern excavating machinery, all of which will later be available for use on other river works in other parts of Japan. The department of home affairs has furnished THE FAR EASTERN REVIEW with the following inventory of equipment now in use (exclusive of machine shop equipments):—

	Capacity	Number.
Locomotives ..	20 tons	23
Steam shovels ..	200 <i>tsubo</i> (in 10 hours)	18
Dump cars ..	18 cu. ft.	1,765
Dredgers ..	400 <i>tsubo</i> (10 hours)	2 (illustrated)
" ..	200 "	6
" ..	100 "	5
" ..	70 "	1
" ..	50 "	1
" ..	40 "	1

	Capacity	Number.
Dredgers ..	25 <i>tsubo</i> (10 hours)	1 Total 17 dredgers
Tugs ..	43 h.p.	1
" ..	20 h.p.	3
" ..	14 h.p.	3
Earth carrying flat boats ..	10 <i>tsubo</i>	16 (steel)
" ..	—	508 (wood)
Railroad ..	60-lb. rails	23 miles
" ..	30 "	108 "
" ..	12 "	85 "
" ..	9 "	99 "
Cars for transporting earth ..	9 sq. ft.	3,549
" ..	7 sq. ft.	3,650
" ..	"	5 (iron)
Rock drills ..	5 h.p.	3
Travelling steam cranes ..	8 h.p.	17
" ..	5 h.p.	1
" ..	3 h.p.	5
Centrifugal pumps	900 gallons per second,	7
" ..	550 "	3
" ..	400 "	11
Steam pile drivers		
weight of poise	0.74 tons	1
" ..	0.6 tons	1
" ..	0.5 tons	1
Concrete mixers ..	17 cu. ft.	2
" ..	11 "	7
" ..	6 "	1
Superintendent's launches ..	20 h.p.	1
" ..	10	2
" ..	9	2
" ..	6	4
" ..	5	2

Tsubo = 36 sq. ft.: *Ken* = 6 feet.

Far Eastern Timbers (concluded from page 140)

The matter is also complicated by reason of the fact that a bamboo specimen is divided into sections, by divisions at right angles to its axis.

It would, of course, be very much better to have even very rough and approximate figures concerning this interesting Far Eastern wood than to have none at all. No doubt, in the course of time, some such figures will be available.

Concerning the woods of China, it may be added that every encouragement should be given to schemes for reforestation. Apparently, in the struggle for survival carried on for centuries by the inhabitants of China. More and more land has been used for agricultural purposes and the trees of the country have not only had to provide fuel but they have been cleared in order to make room for land under cultivation. This process is apparently continuing at such a rate as to cause the utmost concern to those scientists who have carefully considered the matter.

The fact that such a great proportion of the timber used by engineers in China are imported suggests that it is time that some attention is given to the subject of providing native timber.

We cannot altogether separate this problem from the general question of the development of the natural resources of China. If coal were available all over the country less wood would be consumed as fuel.

At present, it seems that a great deal of timber is imported from South Eastern Asia and America. There are fairly complete records of the physical properties of the timber from America. These are to be found in American publications. It is hoped that the figures given above concerning the physical properties of Far Eastern woods will lead to the publication of further data obtained in other parts of the Far East.

Private Railways and Tramways in Japan



Logging Railway in Formosa: Shay Geared Locomotive

ACCORDING to a report of the department of railways dated October 1, 1922, the number of private railways open to business in Japan was 156, with a total mileage of 2,256 miles. Steam railways were 131, with mileage of 1,892 miles. Electric railways, including three electric cable lines were 25 in number, with a total of 204 miles. The balance of ten railways were mixed steam and electric power, with one line operating hand-pushed cars.

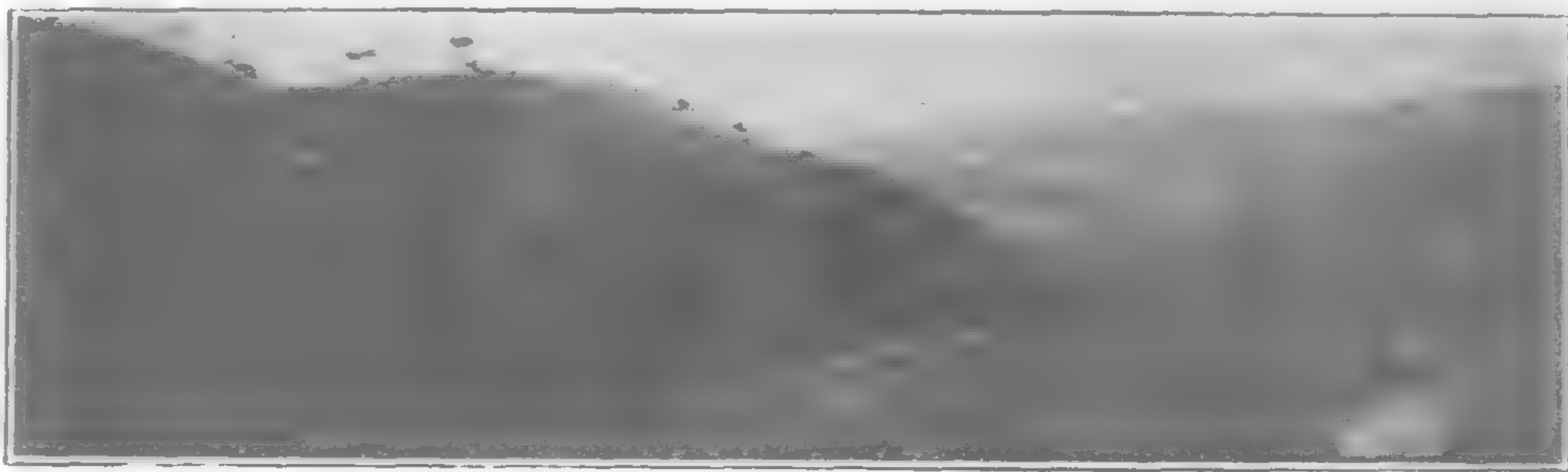
The capital of these companies amounted to Y.388,967,951, of which Y.235,735,451 represented the steam railways, and Y.79,942,500 that of the electric railways, and Y.71,490,000, the capitalization of the other ten lines. Costs of construction for all these lines was Y.213,018,989, of which Y.149,937,857 went into the steam lines.

There were 93 railway companies licensed to begin construction of 66 steam lines and 27 electric lines with a total mileage of 1,070 miles. Estimated costs of construction are Y.113,014,865,

of which Y.58,520,947 represents the costs of the steam lines, and Y.48,847,283 that of the electric lines.

Besides these companies licensed to construct, there were 119 companies who had obtained licenses to lay railway lines over a total of 1,627 miles. Of these lines 65 are steam railways, with a mileage of 1,008 miles. There are 44 electric lines, with a mileage of 554 miles, there are also seven electric cable lines, and two underground railways licensed also. Besides these lines two others to be operated by gasoline motor car have been licensed. Their mileage is 5.2 miles, and costs of construction are estimated Y.220,000.

Working results: The per mile per day income of 99 private railway companies in Japan, having a 3-ft. 6-in. gauge, amounted to Y.0.63571 during 1921, and in 1920 to Y.0.5843. The



The Limited Express of the Imperial Government Railways in the Hakone Pass

income of the 46 railways having a 2-ft. 6-in. gauge in 1921 was Y.0.27244, slightly below that of 1920, Y.0.27263. The 3-ft. 6-in. gauge railways increased their income 8.7 per cent., but that of the 2-ft. 6-in. gauge lines decreased by about one-tenth of one per cent.

The narrow gauge lines show a total revenue decrease of 39.2 per cent. for the year 1921, but this is offset by a decrease in operating expenses amounting to 11.5 per cent. The 3-ft. 6-in. gauge lines increased total profits by 22.3 per cent. in 1921.



Typical "Push Car" Tram Line in Japan: There are 11 companies operating 51 miles of such lines in Japan



The Horse Car is still found in Japan's Rural Districts: 49 companies operated 146 miles of these lines

The following table shows details of income, and expense of these two classes of railways ; per day per mile:—

1. 3-ft. 6-in. Gauge Lines.

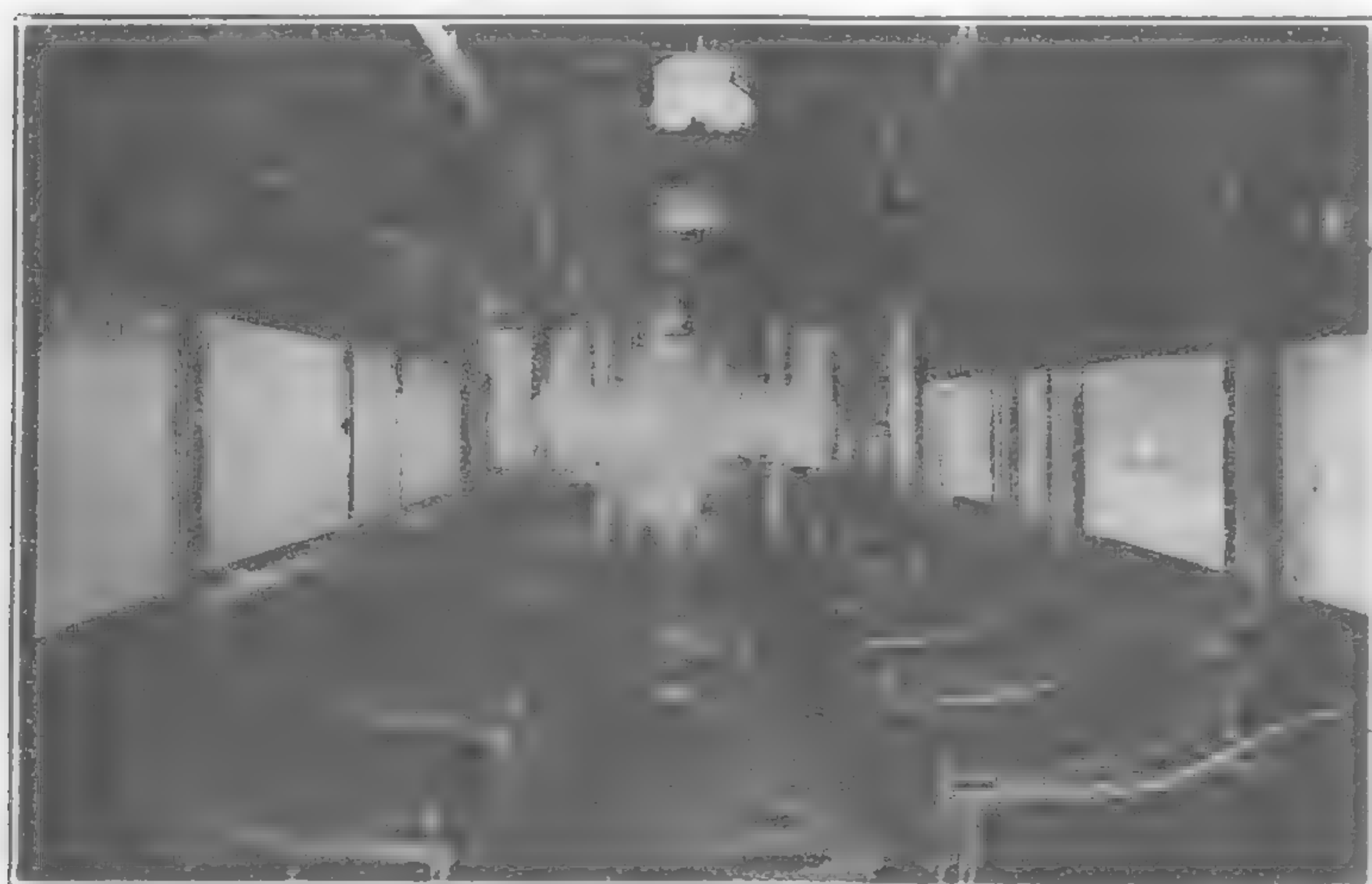
	1921	1920
Income	Y.0.61777	Y.0.58430
Itemized:		
Passenger traffic	0.39373	0.38031
Freight Traffic	0.21331	0.17150
Miscellaneous income from railway operation	0.01073	0.01273
Miscellaneous income	0.01794	0.01976
Total Income	Y.0.63571	Y.0.58430
Expenses	1921	1920
Upkeep of line	Y.0.06412	Y.0.05652
Costs of rolling stock	0.13488	0.15620
Operation of trains	0.07977	0.07715
Taxes	0.03701	0.03030
General costs, business expenses, etc. .	0.03346	—
Total Expenses	Y.0.34924	Y.0.35006

Percentage of business expenses compared to business income	68.7%	77.5%
Average cost of construction per mile opened to business ..	Y.47,321.00	Y.43,144.00
Percentage of profit compared to cost of construction	6.8%	

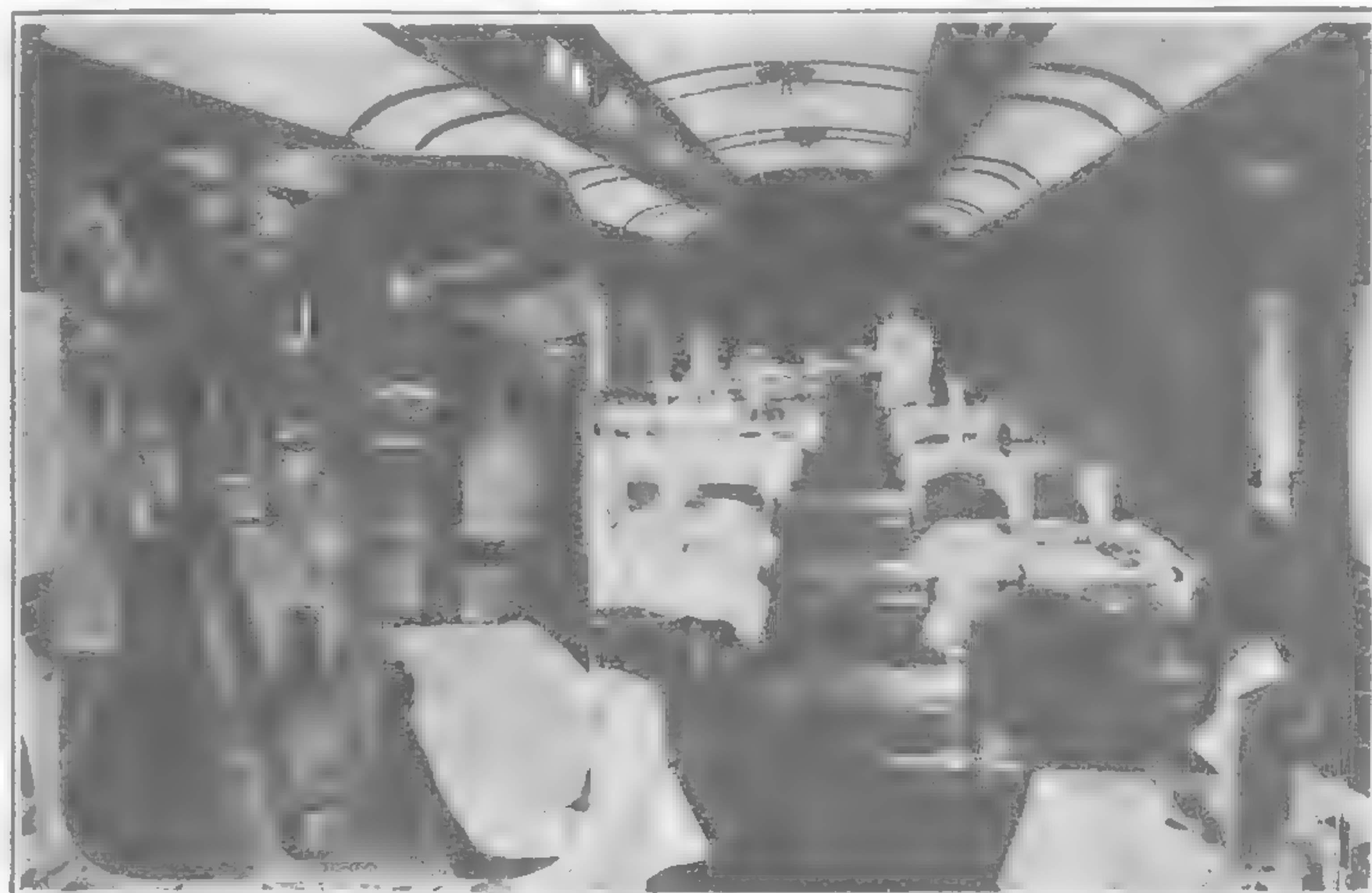
Tramways. (Light Gauge Railways).—On October 1, 1922 there were 97 electric tramways licensed, of which 70 were opened to business. Mileage in operation was 851 miles 33 chains, and the lines not yet open to business will operate 536 miles 30 chains. The capitalization of these companies amounts to Y.916,568,581, of which Y.848,524,581 is that of the lines open to business.

Of 32 steam tramway companies licensed, only 27 had opened lines to business, a total of 264 miles 66 chains. New franchises will add 129 miles 11 chains, and of this total 65 miles and 78 chains have been licensed for construction. The capitalization of the companies open to business is Y.15,536,360, and of those not yet open to business Y.1,270,000, a total of Y.16,806,360.

The mileage of the lines operated by gasoline motors open to business was 37 miles 37 chains, owned by six companies. There are nine more companies licensed to construct 112 miles 19 chains.



TRAVEL DE LUXE ON THE LIMITED EXPRESS OF THE IMPERIAL GOVERNMENT RAILWAYS
The Observation Car



Sleeping and Dining Car, attached to all Express Trains

Profit	Y.0.28647	Y.0.23424
Percentage of business expenses compared to business income	54.9%	59.9%
Average cost of construction of one mile opened to business ..	Y.93,404.00	Y.83,058.00
Percentage of profit compared to cost of construction	11.3%	9.9%

2. Gauge 2-ft. 6-in. (46 companies).

	1921	1920
Income	Y.0.26244	Y.0.25948
Passenger traffic	0.17582	0.17156
Freight traffic	0.08688	0.08612
Miscellaneous income from railway operation	0.00504	0.00180
Miscellaneous Income	0.00470	0.01315
Total Income	Y.0.27244	Y.0.27263
Expenses		
Upkeep of Line	Y.0.03707	Y.0.03738
Costs of rolling stock	0.07951	0.10550
Operation of trains	0.03192	0.03917
Taxes	0.01380	0.01759
General Business expenses	0.01770	0.01163
Total Expenses	Y.0.18700	Y.0.21927

The capital of this group of companies amounts to Y.4,825,000, and Y.855,000 represents that of the companies now in operation.

This same report shows that on October 1, 1922, there were 49 companies licensed to operate horse tramways, of which 32 were open to business. Lines opened to business operated 146 miles 75 chains of track. Another 135 miles 13 chains are licensed for construction, and 19 miles 13 chains to begin work. The capital of all these companies is Y.18,588,350, of which Y.16,422,000 represents that of the companies open to business.



Central Railway Station at Kyoto

Tram lines operated by hand pushed cars are still in existence. At the date of the report there were 11 in operation, and 16 licensed. There were 51 miles 40 chains of lines open to business, and 22 miles 2 chains licensed to begin work, and 19 miles 66 chains licensed to construct. The capital of these companies amounts to Y.1,831,059, of which Y.1,360,159 is that of the companies open to business.

Coal Mining in Japan; Past and Present

Past

NO record of the first use of coal in Japan exists. Tradition dates it in the fifteenth century, and it is known that in 1702, coal was in general use among the people of Chikuzen and Nagato provinces in the island of Kyushu. It was in common use for cooking and heating the bath.

In 1721 the great Miiké, coal field was discovered in Hirano-mura, Miiké-gun, Chikugo province, Kyushu; and the Takashima field was found towards the end of the eighteenth century. In the Tempo era (1830-1843) a field of anthracite coal was uncovered in Shimosujima, Amakusan, Kyushu, and in the same era many of the most valuable fields still worked were discovered in Iwaki province and in the Hokkaido. The domestic use of coal was naturally very limited, especially as the daimyo controlled the use and production by sumptuary laws. Interest in coal as a fuel was stimulated in the Meiwa era (1765-1773), when means of using coal in the manufacture of salt was discovered; markets for transactions in coal was opened in the central districts of Japan, and the island of Shikoku, where the coal commission business is still centered. The first recorded coal selling business—coal broker—is found in the Tempo era.

When the king of Holland in 1885 presented the Shogunate with a steamship, the government, at once, prohibited the sale of coal to private persons because practically all the lump coal then mined was needed for the operation of this vessel. The annual production of coal at that time was limited by the law of the daimyo of Chikuzen to 100,000,000 *kin* (about 52,000 tons). Mining method were most primitive, because of the complete absence of machinery for excavation and lack of engineering knowledge, it was only possible to cut the outcrop seam by horizontal shallow pits. The only vertical shaft in 1855 was at the Onoura pit in the Miiké field. This shaft was 40 feet deep, and had a horizontal extension of 230 feet.

Foreign mining methods were introduced in 1867 at the Takashima Mine. The results obtained caused a revolution of thought among the coal mine owners, but the disturbances of the Meiji restoration for some years retarded the development of modern methods. In 1869 the new government issued an order that license to mine coal should be granted to all persons applying for them, but until the daimiate governments were abolished in 1873, no progress was made in developing the coal resources of the country. As soon as the daimiate restrictions were done away with a great increase of interest in coal mining began, and for a time the business of mining coal became so brisk that a panic was almost brought about by its too rapid and unconsidered expansion.

The new government as successor to the daimyo governments assumed ownership of the Miiké and Takashima mines. It at once put the Takashima Mine under the direction of a foreign engineer, and the Onoura pit of the Miiké field was equipped under foreign direction with the most improved and efficient machinery.

The new law caused a remarkable development of coal mining between 1873 and 1892, by private capital. The government released its control of the Miiké and Takashima mine after a very short period of operation, and private enterprise opened and exploited new fields, still worked, at Tagawa, Babazan, Meo, Takao, Toyokuni, Akaike, Kaho, Tadakuma, and Katsuno in Chikugo. The first mining guild was organized in Chikuho during these years.

In 1873 the government began a mineral survey of the Hokkaido under the supervision of an American engineer, and in 1889 a loan

of Y.1,500,000 was made by the government to the owners of the Horonai and Ashinuma mines for development purposes. In 1889 the Hokkaido Tanko Kisen K. K. was established with a capital of Y.6,500,000, purchasing the Horonai, Ikuharubetsu and Sorachi mines from the government, and later absorbing the Yubari coal mine.

In the Iwaki district such mines as the Shiramizu, Ishizawa, Onigasawa, Kumakake and Tayazawa were opened, and in 1883 the Iwaki Tanko K. K. was organized to absorb the Onoda Tanko K. K. in this district.

As the result of the opening of all these new mines, the production of coal rapidly increased, and it reached 3,000,000 tons. This was an increase of 1,500 per cent. compared with 1874.

These years of expansion were also years of improvement of equipment. In 1871, the Takashima mine drove a vertical shaft 130 feet deep. The first machine operated by steam power used in a Japanese coal mine was installed in a Chikuho mine in 1881, and at once great haste was made by all other miners to follow this example. Shaft winches were operated by steam machines and a great revolution in the coal mining industry at once followed. Colliery railways were introduced in 1880; the first being laid between Temiya and Horonai in the Hokkaido. In 1887 a light railway was constructed between Onoda and Onahama in Iwashiro province, and the port of Moji for shipment of coal from Kyushu was opened opposite the city of Shimonoseki on the Kyushu shore. In 1891 the railway between Wakamatsu and Naokata was completed, and the harbor of Wakamatsu was dredged to accommodate deep draft vessels. Piers for handling coal shipments were also constructed, so that this harbor became Japan's most important coal shipping port.

As the industry expanded, and the needs of the domestic market were met, interest in Japanese coals began to show itself in China, so that exports to Hongkong and Shanghai had begun before the Chinese-Japanese war. The general advance in all industries which followed that war increased demand for coal in the domestic industries, and the highest point of prosperity ever known by the coal miners, until the European war, was reached in 1898-1899. Most of the coal mining enterprises in Kyushu were begun during the period after the Chinese-Japanese war. Like other of Japan's industries, the prosperity of the coal mining industry has been greatly advanced by the Russo-Japanese war and the great war.

Present

The latest figures available for a study of coal mining in Japan are those published by the department of agriculture and commerce for the fiscal year ended March 31, 1921. According to them in that year there were 731 coal mines which were in active operation over an area of 419,484,815 *tsubo* (*tsubo*=36 sq. ft.), while there were 1,066 mines licensed to open mine area of 363,393,126 *tsubo*. This is a marked decrease when compared with operating mines in 1919, when there were 789 mines in operation, covering an area of 424,913,811 *tsubo*. The decline in manufacturing consequent on the panic of April, 1920, adequately accounts for this falling off. Until the beginning of 1920 there was a very marked advance in the increase of coal production, but in the latter half of that year, many mines were obliged to stop work, either temporarily, or as has turned out in many cases, permanently.

The annual production of coal in Japan, excluding Formosa and Chosen, was on the increase year after year until the industrial depression of 1920 gave the industry a serious setback. The

figures of production given in the following table are from the official government reports :—

Year	Quantity	Value
1877	499,106 tons	Y. 1,036,490
1887	1,746,296	3,077,010
1897	5,188,157	18,993,843
1902	9,701,682	32,240,580
1907	13,803,969	59,961,264
1911	17,632,710	55,006,501
1912	19,639,655	61,412,837
1913	21,315,962	70,956,121
1914	22,293,419	80,350,387
1915	20,490,747	65,068,894
1916	22,901,580	80,625,582
1917	26,361,420	140,009,591
1918	28,029,425	286,032,498
1919	31,271,093	442,540,941
1920	29,245,384	418,073,754
1921	26,220,617	227,674,056
1922 (Jan.-Sept.) ..	18,295,535	—
1922 (whole year estimated) ..	24,462,144	—

Production in 1922 during the first nine months of the year increased 1,145,765 tons, about 6.7 per cent. when compared to the same months of 1921. The production of the leading coal mines in Japan amounts to about 85 per cent. of the entire production of the empire, excluding Formosa and Chosen, neither of these countries having sufficient supplies for its own use.

Coal production in Chosen and Formosa up to the end of the fiscal year ended March 31, 1921 is given in the following table.

Chosen			Formosa		
Year	Quantity	Value	Quantity	Value	
1911 ..	121,304 tons	Y. 539,497	252,898 tons	Y. 936,635	
1912 ..	127,870	557,802	276,246	976,584	
1913 ..	127,989	570,158	319,371	1,222,158	
1914 ..	183,262	510,752	342,787	1,311,129	
1915 ..	229,121	997,746	379,368	1,456,478	
1916 ..	190,760	819,221	509,887	1,905,696	
1917 ..	195,140	1,149,332	673,008	2,930,271	
1918 ..	188,623	1,515,873	801,520	5,501,363	
1919 ..	219,554	2,124,831	1,086,607	8,825,002	
1920 ..	289,036	3,917,153	1,139,368	9,148,809	

Since the first exports of coal were made to South China, Japanese coal has been in ever increasing demand in the Far East, particularly for bunker coal, stove coal, and locomotive use. Exports, and import,—made principally from Manchuria, are given in the following table for the past three years :—

Exports			Imports		
Year	Quantity	Value	Quantity	Value	
1919 ..	2,000,679 tons	Y. 37,723,540	699,646 tons	Y. 18,588,181	
1920 ..	2,129,530	45,200,117	797,155	19,917,538	
1921 ..	2,387,709	37,814,960	777,255	14,092,993	
1922 (Jan.-Nov.) —	—	20,967,000	—	14,843,000	

(Figures of Department of Finance.)

Singapore and the Malay states are to-day the centre of competition for Japan's coal export trade. Coal mined in Africa and in India in addition to the domestic coal competes with Japan's exporters in these markets. During the past year, due, to the release of the prohibition on the export of coal from India, competition in the markets of the Far East was very severe, and the price of coal declined steeply, which accounts largely for the very low value of the exports last year.

The business depression continuing strongly to affect the coal mining industry, the miners in the Hokkaido and Kyushu districts entered into agreements to limit outputs during 1922 by an average of 15 per cent. of their total productive capacities. Average

normal annual production is 29,000,000 tons but through this limitation of production production in 1922 was brought down to (estimated) 24,000,000 tons. The limitation was abolished in October, but it is not expected that the production for the year will be materially increased therefrom.

The limitation in production did, however, effect a gradual rise in price. The shipping price at Wakamatsu for No. 1 Kyushu lump, and of Hokkaido No. 1 lump, at Otaru and Muroran, ranged from Y.13.00 to Y.14.00, per ton, in the summer of 1921, but in 1922 rose to Y.17.00 to Y.18.00, with the approach of the winter season. Shipping and manufacturing companies, however, have failed to show any increase in demand, and the limitation of armaments has recently begun to show its effects on the coal market too, by decreasing the demand from the navy department. Generally speaking, it is believed that the market for Japanese coal, both at home and abroad, is now being materially threatened by the growing development of water power, and the substitution of petroleum for coal fuel. Coal operators look forward to an anxious period until such time as the manufacturing industries of the country have become more settled.

Railways in the F.M.S.

(Concluded from page 133)

depth has been reached. A test load of 100 tons of kentledge, in addition to the weight of the concrete cylinder, was then applied, and no cylinder was passed as satisfactory until it had stood forty-eight hours without settlement under the total load, which is equivalent to five tons per square foot, and considerably greater than the ultimate load to be borne by the foundations.

At the beginning of this year a through fast weekly service was inaugurated between Penang and Bangkok in Siam, bringing the latter town within thirty-four hours of Penang and within sixty hours of Singapore. This service has been so successful that it is more than probable that it will be run twice a week in the near future.

The permanent way is composed of flat-footed rails spiked on to hardwood sleepers. The standard weight of rail for trunk lines is 80-lb. to the yard, and for the less important lines 60-lb. to the yard, both of British standard section. Throughout practically its whole length the track is ballasted with stone ballast. A great deal of trouble has been experienced from time to time owing to wash-outs and floods consequent upon the deforestation of the country which its development entailed. The general raising of other areas from silt from tin mines has also necessitated a systematic raising of the line and bridges in order to keep above flood level. There are no remarkable bridges in the country, such long bridges as there are being multiples of 100-ft. or 150-ft. spans. Locally bridges as there are being multiples of 100-ft. or 150-ft. spans. Burnt bricks are used in the construction of culverts and bridge abutments, the bridges themselves being obtained from England.

The standard locomotive is of the "Pacific" type, and weighs, engine only, 55 tons. The present maximum axle load is 12 tons, but the future maximum now allowed for in specifications is 16 tons. A few "Mallet" type articulated locomotives are also in use. The fuel for these locomotives is now obtained from the Malayan collieries near Rawang, but previous to the development of this coalfield, Bakau wood, cut from the Bakau swamps, was entirely used. All the passenger vehicles are bogie stock, corridor type. The standard goods wagon is a 10-ton four-wheeled vehicle, but there are, of course, special vehicles in use.

Probably in no other country in the world has railway development been so rapid as in the Federated Malay States, and a most remarkable fact is that the money to construct this fine system of railways has been obtained from the revenues of the Federated Malay States as a whole.—*The Engineer.*

The Marshall Islands

Progress under Japanese Rule; Native Requirements Broadening with the Advance of Civilization

By Thos. J. McMahon, F.R.G.S.

AT a recent conference of the league of nations, Japan was praised for the humane government of the natives of the Pacific Islands now under her care by the powers of mandate. The writer has had the opportunity of witnessing the efforts of the Japanese administration in the Marshall Islands.

This group of islands, or more properly atolls, lies to the north of the equator, and adjoins the British colony of the Gilbert and Ellice islands. The Marshalls are little more than 150 square miles, they possess a moderate tropic climate, and the present chief resource is copra, or coconut.

German Misrule

Formerly the Marshalls were German owned, and the natives did not receive fair treatment, they dwindled away from some thirty thousands to a mere nine thousand. Under Japanese administration the islanders are assuming a new and more active life. They are awakening in their new civilization to a sense of importance; they are no longer a poor, and miserable race. In ten years time under the present conditions they will be a progressive people, healthy in body and mind, and the population will have considerably increased.

The Marshall islanders are undoubtedly developing a charming national character, three parts native, and one part Japanese. They are polite, and no official or stranger is passed without the low, sweeping, graceful bow of Japan. They never use the offensive word "Jap," it is distinctly "Japanese" at all times. At first they were not contented with the Japanese administration, but to-day they realize they are well cared for, and progressive.

Schools and Hospitals

When in 1914 the Japanese took over the management of the Marshall Islands at the request of the allies, German laws and conditions were promptly replaced by those of Japanese. Every effort was made to stimulate trade and coconut production. A fine wireless plant was installed at Jaluit, the capital. A school, with Japanese teachers, men and women, was opened in the capital, boys and girls from every atoll were brought to the school, and a high standard of education begun and maintained, the Japanese language was made compulsory. The Marshall children are bright and intelligent and they quickly progressed under their teachers. Encouraged by this educational success the administration began at once the planning of higher grade schools, of rewarding pupils by making assured positions both administrative and commercial.

The Japanese administra-

tion did not stop at this, they have accomplished much, and which is worthy of all praise, in tending the health and comfort of the natives. There is a large general hospital in Jaluit, with Japanese doctors, orderlies and trained nurses. The natives are encouraged to come from all parts of the group and be medically treated, and free of any charges. On any day of the week may be seen hundreds of natives, men, women and children around the hospital, all receiving kindness and medical skill.

Brighter Social Life

And more the Japanese administration has been and is very thorough in helping the native people to a brighter social life. The civilization of the people is most marked. Native houses are supplied with Japanese maps, pictures, almanacs, and books; colored portraits of the Japanese imperial family adorn the walls. Native women do up their hair as do Japanese ladies, they comb and scent it with combs and pomades made in Japan; their wardrobe is not complete without a Japanese fan, and a smart kimono. The Marshall Island chief carries a Japanese walking stick, his suits are made by Japanese tailors, or he wears a bright kimono. Japanese umbrellas are very common in the Marshalls. Indeed, in the last few years there has been generally a thorough domestic social and national change in the Marshall Islands.

Industrial Encouragement

One of the first acts of the Japanese administration in taking over the Marshalls was to issue regulations that all waste lands on the atolls should be planted with the valuable coconut palm. The natives thought this was beyond their power, they complained they had not the numbers, or the labor to complete such a task. The administration insisted, and to-day many acres, once idle and wasted are soon to be fruitful, and the natives recognize how wise were the regulations. In ten years time the output of coconut in the Marshalls will be three times greater than what it was when the Japanese took over the group. The natives are pleased with results.

The possibilities of new industries in the Marshalls have not been overlooked. It is said that as time goes on, and administrative funds allow the natives will be encouraged in Panama hat making, in the manufacture of string, and rope from coconut fibre, in making dyes, in making mats, fans and other articles.

Such are the conditions obtaining in the Marshall Islands these days; passed over to Japanese protection they will be some day a commercial territory of importance. The natives are no longer "black barbarians" without hopes or ambitions." Stimulated by the example of the industrious Japanese they will be proud and prosperous, their lagoons will no longer be empty, but busy waterways of commercial activity.



Administrative officials of the Marshall Islands and Mr. Thos J. McMahon



A Group of Japanese officers, petty officers and sailors at Jaluit, Marshall Islands. The lady is the Japanese School Mistress. The little boys in front are Marshall Islanders and school boys under Japanese teachers. The Japanese are in occupation of the islands for the Allies and have governed them well



Johore Causeway. South (Woodlands) End of Causeway in Progress

Railways in the F.M.S.

THE Federated Malay States Railways' system serves not only the Federated Malay States proper but also the Straits Settlements and the Unfederated States of Kedah, Perlis, Kelantan and Johore. Of the 1,020 miles of line open for traffic, the Federated Malay

States government owns all but 120 miles running through Johore state. The entire system is operated by the Federated Malay States Railways, the Johore line being leased to it by the Johore government. The first length of line laid was from Taiping to Port Weld, in Perak, a distance of eight miles. This line was built by Perak state, and was opened for traffic on June 1st, 1885. In the following year the first line in the state of Selangor was opened from Kuala Lumpur to Klang, a distance of 21½ miles.

Steady progress was maintained in both states, and in 1901 the first general manager and chief engineer was appointed to control both the Perak and Selangor State Railways. The mileage open for traffic by the end of 1901 had increased to 244, of which 97 were in Selangor and 147 were in Perak. By the end of 1903 the

mileage open for traffic had increased to 340, the two systems had been linked up, and through communication was established from Penang in the north to Seremban in Negri Sembilan. It is interesting to recall that the first through passenger train from Perak was one conveying his highness the sultan of Perak and suite from

Kuala Kangsar to Kuala Lumpur on the occasion of the second and last conference of chiefs of the Federated Malay States.

During 1904 the main line was carried further south towards Malacca and Johore state. An agreement was also completed with the government of the latter for the construction of a line from the Federated Malay States frontier to Johore Bahru opposite Singapore island, and the construc-

tion of this line was started from the southern end in December, 1904, and from the northern end in March, 1905. This line ran through jungle for practically its whole length, and when the survey started in March, 1904, great difficulty was experienced owing to the total lack of communications over 100 of the 120 miles the line was to cover. Except in the vicinity of Johore Bahru itself, roads were unknown. The first portion of this line to be opened was a section of 16 miles



Train of New Boat-Type Carriages Approaching Seremban.



Prai. Side View of Jetty taken from Southern Reclamation

F.M.S. RAILWAY IMPROVEMENTS 1922-23



Johore Bahru. View of Lock, Looking West



THE JOHORE CAUSEWAY

Johore Bahru. General View of Lock and Commencement of Causeway



Kelantan Bridge: Foreground, North Abutment, then Pier No. 1; Cofferdam for Pier No. 2; then Sand Bag Island for Pier No. 3

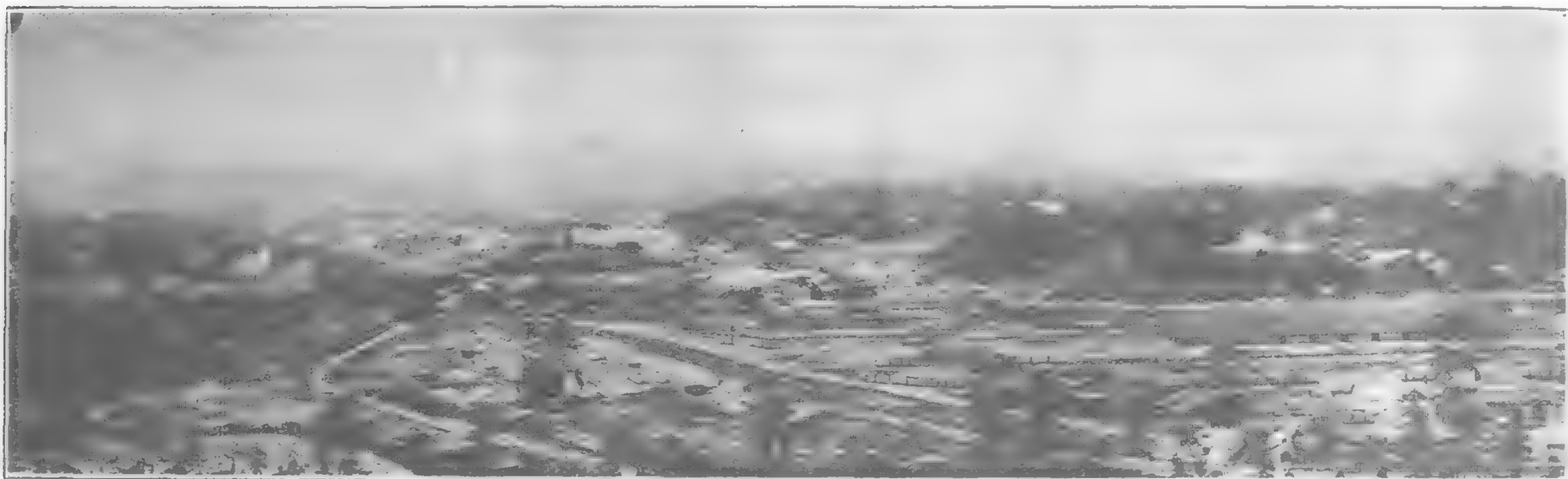


Central Workshops, Kuala Lumpur: Overhead Cranes in Carriage Shop

from the Negri Sembilan border to Segamat on March 1st, 1908. By August, 1908, 70 miles were ready for traffic, but were not opened, as the Johore government wished to have the whole of the remaining portion of the line opened at the same time. This was done on July 1st, 1909, and through communication was thereby established between Penang in the north and Johore Bahru in the south. Following close upon this came the completion of a wagon ferry across the Straits separating Singapore island from the mainland, which was put into service on January 1st, 1910.

The Singapore government had already opened a line in January, 1903, running from Woodlands on the northern shore of Singapore island to Singapore itself, 19½ miles, and this was purchased by the Federated Malay States government in 1913. With the inclusion, in 1912, of the Johore State Railway in the Federated Malay States administration, and the extension of the main line through Kedah to Alor Star, the capital of that state, in 1915, and subsequently through Perlis to the Siamese frontier at Padang Besar in March, 1918, the Malay peninsula found itself with a well-equipped railway worked by one administration, offering transport facilities from end to end of the peninsula and a service for both goods and passenger traffic, which, it is asserted, is not surpassed by that of any other colony or protectorate.

Sight has not been lost of opportunities for linking up coast towns and for opening feeder lines. As far back as 1893 the port of Teluk Anson in Perak as linked up to the main line at Tapah-road, serving an important rubber-growing and tin-mining centre. The Kinta valley—the most important tin-mining district in the world—was further tapped by the construction of a line from Ipoh (Perak) to Tronoh, 16 miles, opened in 1905. In Selanger in the same year a branch line was opened to serve the railway workshops, on the outskirts of Kuala Lumpur, and the quarries at Batu Caves, where there are unlimited supplies of road metal. This also is a rubber-growing district. Tin mines at Ampang, near Kuala Lumpur, were supplied with a line constructed in 1914. In the following year an important branch line was opened for traffic from the Malayan collieries at Batu Arang, joining the main line at Kuang, seven miles away. This branch has since been extended for seven miles towards the west coast. Port Swettenham, on the west coast, five miles beyond Klang, to which point the first Selangor line was built in 1886, was connected up in January, 1889, and shipping has grown rapidly, since Port Swettenham offered facilities which the older port of Klang, served only by river, could never offer. Ships of the most prominent goods lines trading to the East can be seen here at any time discharging machinery, railway material,



General View of Seremban: Showing New Goods Shed, Hump Yard and Station

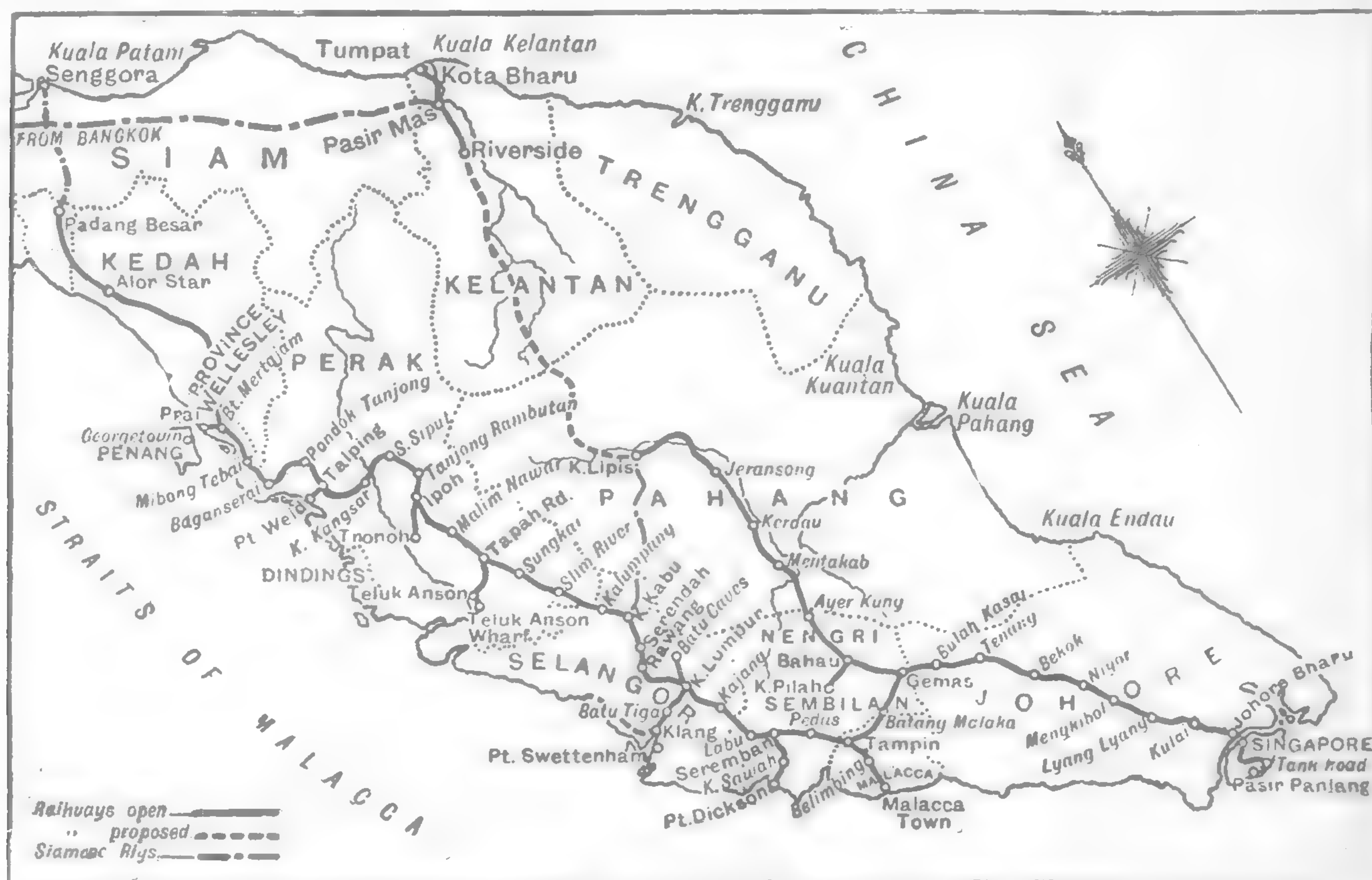
Goods traffic across the Straits from Johore Bahru on the mainland to Singapore island is carried by wagon ferries, transshipment thus being obviated. Passengers are taken over by a passenger launch, but a causeway across the Straits is at present being constructed, and, when that is completed, trains will be run right through to the centre of Singapore itself. In addition to two lines of rails this causeway will also carry a road. The distance across is 3,480-ft. For various reasons, however, including that of the enhanced cost of materials, it was decided to construct a causeway, which consists of a large bank of granite rubble extending across the Straits from Johore Bahru station on the mainland to a point about 350-ft. north-east of Woodlands on the Singapore side. The total length of the structure is about 3,480-ft. The bank is situated in a considerable depth of water, the average being 47-ft. at low water. It has a width at the top of 60-ft., which affords room for a double line of railway, and a 26-ft. 6-in. roadway for vehicular traffic, which is protected on the outer or water side by a concrete parapet wall, and is divided from the railway by substantial fencing.

As the work when completed will entirely close the Straits, a passageway through the causeway for the use of vessels had to be provided for. It is anticipated that there will be slight differences of the levels of the water on either side of the bank, and provision has been made for a lock with double gates capable of dealing with heads of water on either side of the lock. The latter measures 170-ft. between cills, is 32-ft. in width and has a depth of 10-ft. at low water. The road and railway are carried over the lock by means of an electrically operated rolling lift bridge.

foodstuffs and quantities of other articles required for a rapidly developing country, or loading cases of rubber or tin ore, the two principal exports of this peninsula. The wharves admit of ocean-going boats coming alongside, while there is ample accommodation in the roads for boats discharging into tongkangs or lighters. Large warehouses have been constructed close to the wharves for the storage of rubber, rice, etc., and there is a regular service of goods trains to all parts of the peninsula and Siam. Passenger boats, both local and those trading to Europe, also call at the port, meeting the need of the thickly populated central portion of the peninsula which forms the hinterland. From Klang, a line has also been constructed to serve an important agricultural district along the Selangor coast. This line extends for thirty miles, and was completed in 1914.

In Negri Sembilan and Malacca, branch lines run from Seremban to Port Dickson and from Tampin to the old and historical port of Malacca. The Seremban to Port Dickson line (24½ miles) originally belonged to a private firm, and was purchased by the Federated Malay States Railway department and worked by that department from July 28th, 1908. The extension from the main line to Malacca town was opened for traffic in December, 1905.

A glance at the accompanying map of the Malayan peninsula will show that the west coast is much more developed than the east, and naturally the first lines were built where most required. The east coast is not at present served by railway, except in the northern portion of the state of Kelantan, where the Federated Malay States' system joins the Siamese State Railways again at Sungei



F.M.S. Railway Map

Golok. Southwards through Kelantan a line is being built to run through Pahang and Negri Sembilan and join the west coast line at Gemas on the Negri Sembilan—Johore state boundary. In the north this new line was opened southwards from Tumpat for 32 miles south to Riverside in 1914. At the southern end, 146 miles from Gemas have been completed, and are being operated through the states of Negri Sembilan and Pahang as far as Kuala Lipis. This line has one branch serving agricultural districts from Bahau to Kuala Pilah, 13 miles, opened in 1910. The line between Riverside and Kuala Lipis is still under construction. The total length of line opened for traffic at the end of 1921 was 1,020 miles, and 53 additional miles were actually under construction. The railway is mostly single line and of metre gauge throughout, corresponding with the Siamese Railways.

The workshops referred to above near Kuala Lumpur deal with the maintenance and repair of locomotives and rolling stock. Locomotives are usually manufactured in England and erected at the central workshops, but the goods and passenger stock is manufactured there from local timber. These workshops are fully equipped with the modern machinery essential to such an establishment.

Sleeping saloons and dining cars have been running on the night mail trains between Kuala Lumpur and Johore Bahru since 1911. In 1920 similar accommodation was provided on the through trains between Kuala Lumpur and Prai (Penang). Both the sleeping saloons and the dining cars are built at the railway workshops, and will, it is claimed, stand comparison with the stock of any railway in the world. The cabins in the sleeping saloons are roomy, and are furnished with electric light and fans, while each car is fitted with a shower bath. The restaurant cars are likewise electrically lit and have electric fans. The latest development in this direction is the provision of a buffet car, which has recently been completed. At Ipoh and Kuala Lumpur, railway hotels adjoin the stations.

The Federated Malay States Railways are equipped to handle every description of present-day traffic, and, in addition to their own wharves at Port Swettenham, have an extensive scheme on hand for the development of Prai, on the mainland opposite Penang, as a port.

The works consist of (a) a reinforced concrete jetty, 1,100-ft. in length; (b) a coal wharf, 900-ft. in length; (c) the widening and reconstruction of an existing wharf, 600-ft. in length; (d) a lighter basin with 16-ft. depth at low water for small vessels; (e) the dredging of the channel and approaches to a width of 500-ft. and a depth of 30-ft. below low water; and (f) the reclamation of adjacent swamps and foreshore to the extent of 170 acres. Of the foregoing, the first is, perhaps, the most important and interesting. The jetty, which extends seawards from the end of the old wharf, is built on rows of concrete cylinders, seven in each row, spaced 25-ft. apart longitudinally and 22-ft. apart transversely. It has a total width of 142-ft., the coping level being 4-ft. above high water of ordinary spring tides. The cylinders are built up in rings in a blockyard and are allowed to nature for three months before being used. The rings weigh from 10 to 14 tons each, and require special plant for handling and setting them. Each cylinder has for its base a cutting edge ring 3-ft. 6-in. in depth, 11-ft. 6-in. in external and 9-ft. 4-in. in internal diameter. On the top of the ring is a further ring, which tapers from 11-ft. 6-in. to 8-ft. 6-in. in external diameter and to 5-ft. in internal diameter. The top of the latter ring is castellated, something after the fashion of a dog clutch, so as to fit into and key with a ring of the same dimensions as those just quoted, 5-ft. deep, which is similarly castellated both top and bottom so as not only to key with the cutting ring member, but with a similar ring placed immediately above it. The required length of cylinder is made up by adding a succession of exactly similar rings up to 1-ft. 6-in. or so below low water. A final compensating ring, made to ascertained dimensions, then brings the top of the cylinder to the required level, and on the top is then placed a special cap, which is capable of slight adjustment in alignment, and which brings the total height up to 2-ft. above low water level. A reinforced concrete superstructure for the deck of the jetty is built on the tops of the caps.

The cylinders are sunk in steel guide sleeves, which are fixed to a temporary staging, by grabbing out the mud from the hole in the centre and causing the cylinders to sink by adding cast iron kentledge rings, weighing five tons each, as required until the required

(Concluded on page 128)

Far Eastern Timbers

II

(Concluded from January)

Some Facts Concerning Their Properties and Commercial Value

By C. A. Middleton Smith, M.S.C., M.I. Mech. E.

(Taikoo Professor and Director of the Engineering Workshops and Laboratories of the University of Hongkong)

Some Comparative Figures

HERE appear to be three woods in Borneo which give a higher coefficient of bending strength than that recorded from Mai-Takien. In 1919, the writer made a complete series of tests on ten of the more important Borneo timbers and the coefficient of bending varied as follows:—8.06 for Selangan Batu (Philippine name Yacal); for Billian (Philippine name Tambuliam) 7.29; for Mirabau (Philippine name Ipil) 6.77, after which we might take Mai-Takien (Siamese wood) at 5.38 tons per sq. in.

Mai-Yang gave results resembling those obtained for the Borneo wood Red Seriah (Philippine name Red Lauan). The figures for the coefficient of bending strength are Mai-Yang 2.99 and Red Seriah 3.54.

In this connection, it may be of some interest to notice that Foreman arranged the Philippine woods in two columns in order of tensile and transverse strength. To some extent, his order for tensile strength agrees with the order obtained by the writer for the coefficient of bending for the Borneo woods. He puts at the top, however, a wood named Dungan for which the writer has been unable to trace any values, nor has he been able to obtain specimens for testing. Foreman places Yacal (British Borneo name Selangan Batu) second, Ipil (British Borneo name Mirabau), third; he leaves out entirely Tambuliam (British Borneo name Billian). He mentions a number of woods which are not listed in Dr. Foxworthy's Bulletin No. 1 government of British North Borneo department of forestry.

He places Yacal ninth on the list of woods arranged in order to transverse strength and he places Lauan (British Borneo name Seriah) above cedar both for tensile and transverse strength.

Unfortunately, it is not explained exactly what is meant by transverse strength; and in any case, no actual figures are given.

We can, however, compare the coefficient of bending strength and the crushing strength of these woods with those given by Professor Unwin who made a large number of tests in London on specimens of wood sent from various parts.

TABLE I.
BENDING STRENGTH OF FAR EASTERN TIMBERS TESTED
AT THE UNIVERSITY OF HONGKONG

Name of Wood	Country of Origin	Coeff. of Bending Strength Tons per sq. in.
Selangan Batu	British North Borneo	8.06
Billian	"	7.29
Mirabow	"	6.77
Mai Takien	Siam	5.38
Camphor	British North Borneo	4.93
Greanting	"	4.92
Oba Sulu	"	4.92
Orat Mata	"	4.57
Kruen	"	4.45
Kacha	"	4.24
Red Serayah	"	3.54
May Yang	Siam	2.99
Black butt	Queensland	5.79
Spanish oak	St. Vincent	5.78

TABLE II.
VARIOUS TIMBERS ARRANGED IN ORDER OF VALUE OF
BENDING STRENGTH

Name of Wood	Country of Origin	Coeff. of Bending Strength Tons per sq. in.
Red milkwood	Natal	9.52
Mora wood	British Guiana	9.42
Naseberry bullet	Jamaica	9.16
Billy Web	Honduras	9.10
Green heart	British Guiana	8.97
Ironwood	Middle Conser	8.85
Sneeze wood	Natal	8.62
Bullet wood	British Guiana	8.58
White iron wood	Natal	8.56
Mountain guava	Jamaica	8.29
Wallah wood	British Guiana	8.13
Locust	"	8.13
SELANGAN BATU	BRITISH NORTH BORNEO	8.06
Black iron wood	Natal	7.84
Locust wood	Montserrat	7.67
Blood wood	Queensland	7.57
Stink wood	Middle Conser	7.51
Mammee	Jamaica	7.43
Assegai	East Conser	7.30
BILLIAN	BRITISH NORTH BORNEO	7.29
Sneeze wood	Cape Colony	7.22
Saffraan	"	7.21
Iron bark	Queensland	7.05
Crows-ash	"	7.03
White pear wood	Natal	6.95
Mammee sapota	Jamaica	6.95
Mora	British Guiana	6.87
Prime	Jamaica	6.85
White pear	Middle Conser	6.78
MIRABOW	BRITISH NORTH BORNEO	6.77
Assegia	Middle Conser	6.75
Rose wood	Jamica	6.72
Hackia	British Guiana	6.72
Olive wood	Cape Colony	6.65
Satin wood	Jamaica	6.62
Vlier	Middle Conser	6.62
Milla	Ceylon	6.59
Cashaw wood	Jamaica	6.43
Spotted gum	Queensland	6.42
White pear	East Conser	6.42
Blue gun	West "	6.27
Satin wood	Ceylon	6.15
Cherry bullet	Jamaica	6.12
Albizzia	India	6.11
Flat crown	Natal	6.06
Light brown cironballi	British Guiana	5.98
Purple heart	Honduras	5.93
Souari	British Guiana	5.87
Kafir plum	Cape Colony	5.85
Panah Ka	Ceylon	5.78
Hog meat	Jamaica	5.69

Name of Wood	Country of Origin	Coeff. of Bending Strength Tons per sq. in.
Black butt	Queensland	5.79
Spanish oak	St. Vincent	5.78
Keur	Middle Conser	5.68
Fallow wood	Queensland	5.48
Black iron wood	East Conser	5.46
Blackwood	Tasmania	5.45
Bastard cabbage	Jamaica	5.44
Red Els	Middle Conser	5.40
Saffraan	East "	5.40
Black maya	Honduras	5.30
Cluster pine	West Conser	5.39
Mai Takien	Siam	5.38
Stanus yacca	Jamaica	5.25
Pyiurna	India	5.22
Hog gum	Jamaica	5.14
Santa Maria	Honduras	5.14
Stanus Yacca	Jamaica	5.13
Kerse Hont	Middle Conser	5.05
Upright or real yellow	" "	5.02
Cape beach	" "	4.96
Camphor	British North Borneo	4.93
GREETING	BRITISH NORTH BORNEO	4.92
Oba sulu	"	4.92
Lignum vitae	Jamica	4.88
Granadella	Honduras	4.74
Stringy bark	Tasmania	4.72
Stone pine	Cape Colony	4.58
Orat mata	British North Borneo	4.57
Locust wood	Honduras	4.54
Black poison wood	"	4.52
Salm wood	"	4.51
Seaside mahoe	Jamaica	4.45
KRUEN	BRITISH NORTH BORNEO	4.45
Turtle bone	Honduras	4.43
Saffron wood	Cape Colony	4.41
Blue mountain yacca	Jamaica	4.31
Kubucalli	British Guiana	4.26
Vurnanukia	Ceylon	4.25
KACHA	BRITISH NORTH BORNEO	4.24
Seaside grape	Jamaica	4.13
Myrthe	Tasmania	4.06
Upright or real yellow	East Conser	4.04
Common yellow wood	" "	4.03
Yellow sanders	Jamica	4.02
Habing	Honduras	3.97
Gurukina	Ceylon	3.90
Red wood	Honduras	3.81
John crow wood	"	3.75
Dog wood	"	3.74
Common yellow wood	West Conser	3.70
Clanwilliam cedar	" "	3.69
Blue gum	Queensland	3.57
RED SERAYAH	BRITISH NORTH BORNEO	3.54
Sopu	Ceylon	3.45
Bullet wood	Honduras	3.40
Simarupa	British Guiana	3.36
Mountain mahoe	Jamaica	3.24
Whiteels	Middle Conser	3.12
Yoke wood	Jamaica	3.04
Red cedar	Montserrat	3.02
MAI YANG	SIAM	2.99
Wannika	Jamaica	2.93
Spanish elm	"	2.73
Prickly yellow	"	2.70
Hardpear	Middle Conser	2.67
Calabash	Jamaica	2.62
Kauri	Auckland N. 2	2.16

Compression Tests

In 1919, the writer made a number of tests on China fir with the object of finding out the mean crushing stress in tons per sq. in. Some of the specimens were soaked in water. The specimens were obtained from timber suitable for piling. They were three inches in diameter and some of the specimens tested were six inches long while others were fifteen inches long.

A total of forty-eight specimens were tested. The highest figure recorded for the mean crushing stress was 2.62 tons per sq. in. and the lowest 1.29 tons per sq. in., the mean average figure was 1.8 tons per sq. in. (4,032-lbs. per sq. in.)

From each pile three specimes were cut and the results obtained with any three of the specimens from one pile were very uniform considering that the material was timber. Thus specimens Nos. 19, 20 and 20 gave results of 1.75, 1.67 and 1.60 tons per sq. in. or a mean value of 1.67 tons rer sq. in. (3,741-lbs. per sq. in.)

The "wet" specimens were soaked in water for 24 hours except two groups which were soaked in water for fifteen days.

The "wet" specimens gave results which compare unfavourably with the dry specimens of the same type. Thus from one pile three dry specimens gave a mean value of 2.18 tons per sq. in. while three wet specimens gave a mean value of 1.82 tons per sq. in. All of the dry specimens gave a higher value for the mean crushing strength than any wet specimens.

As was expected the specimens six inches long carry a heavier load than the 15-in. specimen although the difference was only about ten per cent. A fair average of figure for the mean crushing stress of China fir is 1.8 tons per sq. in. On the whole the results obtained were uniform.

Now we come to consider the crushing strength of the Siamese woods, Mai-Takien and Mai-Yang. Mai-Takien gave a mean average value of crushing stress 2.89 tons per sq. in. and Mai-Yang 1.69. We will compare all of the Far Eastern timbers for crushing strength. The following table gives the results obtained in the university of Hongkong.

TABLE III.

CRUSHING STRENGTH OF FAR EASTERN TIMBERS TESTED
IN THE UNIVERSITY OF HONGKONG

Name of Wood	Country of Origin	Mean Crush- ing strength lbs. per sq. in.	Mean Crush- ing strength Tons per sq. in.
Billian	British N. Borneo	11,177	4.99
Selangan Batu	"	8,713	3.89
Mirabow	"	7,997	3.57
Mai Takien	Siam	6,470	2.89
Camphor	British N. Borneo	5,532	2.47
Oba Sulu	"	5,398	2.41
Kruen	"	4,860	2.17
China Fir	South China	4,030	1.80
Mai Yang	Siam	3,783	1.69

For the purpose of comparison, the following table is given. It was compiled by the U. S. Forests Service.

Group.	Compressive strength (parallel to grain), lb. per sq. in.	Woods included in Group
I	4,200 to 6,000	Eucalyptus corynocalyx, osage orange, honey locust, mockernut hickory, pignut hickory, emcalyptus globulus and tereticornia, shagobark hickory, shellbark hickory, eucalyptus viminalis
II	3,600 to 4,200	White, green and blue ash, slippery elm, eucalyptus rostrata, rock elm, sugar maple longleaf pine, beech, yellow oak, yellow and sweet birch, red maple, Douglas fir, red oak, white oak, red wood in compression.

(Continued on page 140)



Royal Dutch Petroleum Works at Balikpapan, Dutch Borneo, View from the Harbor

*Petroleum in Borneo

By Arthur H. Redfield

HISTORY OF DEVELOPMENT.—For centuries the natives of Sumatra, Java, and Borneo have used mineral oils, obtained from surface seepages, for various domestic purposes and especially as a remedy for skin diseases. In 1853 Motley noted seepages on the island of Labuan, in the British Borneo and ten years later Menten found seepages on Tarakan Island, off the east coast of Dutch Borneo.

In 1866 a shallow well was drilled on Labuan Island, which gave a small flow of oil for at least thirteen years. Collingwood in 1867 described a petroleum spring in British North Borneo and stated that others were known. About 1887 there were three small producing wells on the Klias peninsula, opposite the town of Brunei.

The first geologic investigation of the Dutch East Indian oil fields was made in 1883 when the geologists G. P. A. Renaud and R. Fennema were sent by the bureau of mines at Batavia to examine the prospective fields of Lower Langkat, in the east coast residency of Sumatra. The oil fields of Java were investigated in the next decade by R. D. M. Verbeek and R. Fennema. The coal and oil occurrences of Koetei, in the south and east coast residency of Borneo were first described by J. A. Hooze in 1888.

The pioneer in the exploitation of petroleum in Borneo was the Dutch mining engineer, J. H. Menten, who in 1863 explored Tarakan island and later the Koetei region. Menten obtained in 1888 the Louise concession at the mouth of Mahakkam river, in Koetei, and in 1891 the Mathilde concession at Balikpapan. In 1897 he commenced drilling in the Sanga Sanga field. Oil was struck at 190-ft.

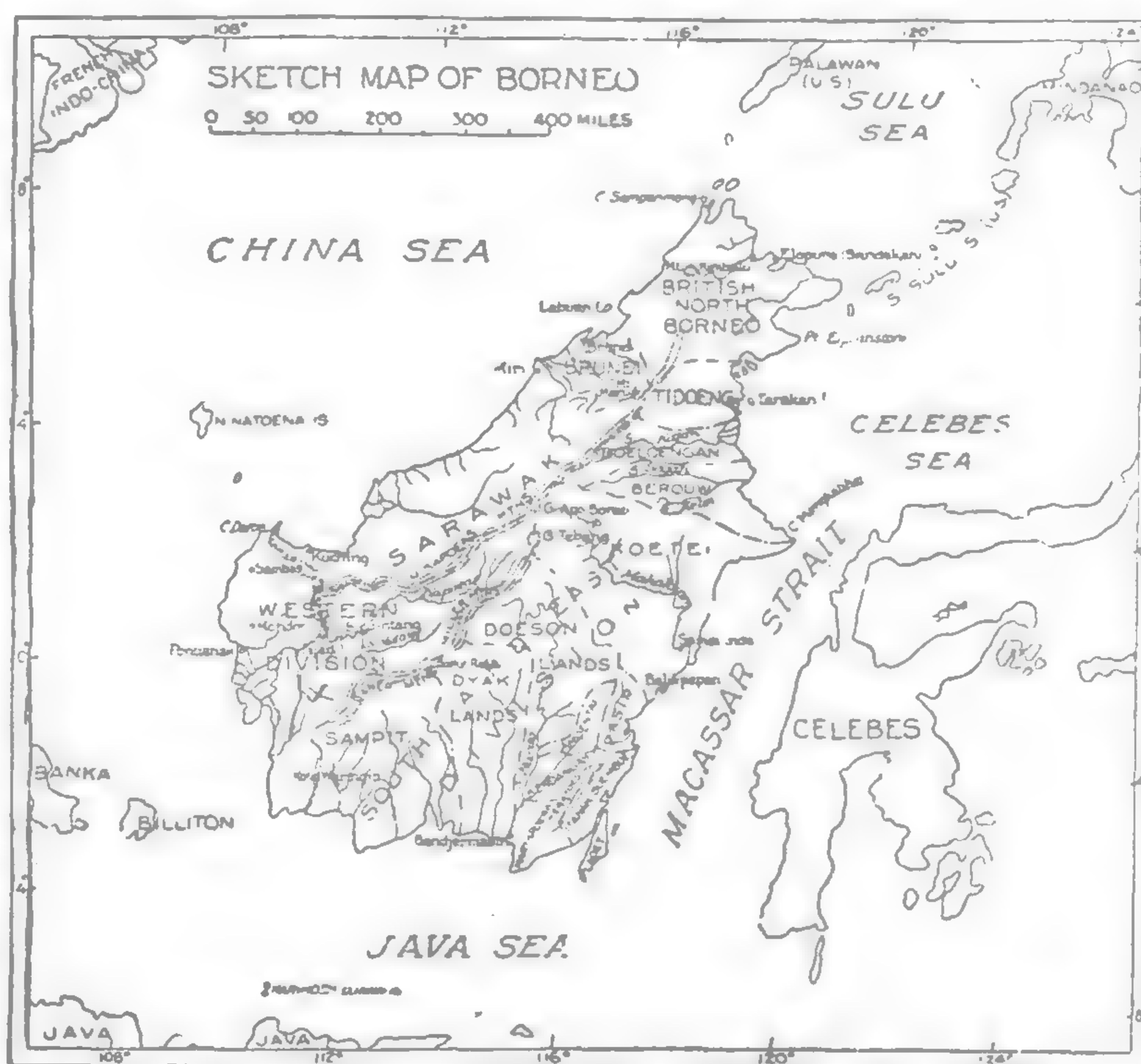
The Menten concessions were transferred in 1898 to the Nederlandsch-Indische Industrie en Handel Maatschappij, which was founded that year, under the control of the Shell Transport and Trading Co., of London. The amalgamation of the Shell Transport & Trading Co., on January 1, 1907, with the Koninklijke Nederlandsche Maatschappij tot Exploitatie van Petroleumbronnen in Nederlandsch Indie (Royal Dutch Company for the working of petroleum wells in Netherlands India) brought the Nederlandsch-Indische Industrie en Handel Maatschappij under the control of the new Royal Dutch-Shell group.

Commercial drilling in Borneo began at Sanga Sanga in 1899. Thirty-four wells were drilled of which 25 were productive. A production of 700 metric tons a day was soon obtained. A refinery with a capacity of 2,000 metric tons a day was built at Balikpapan.

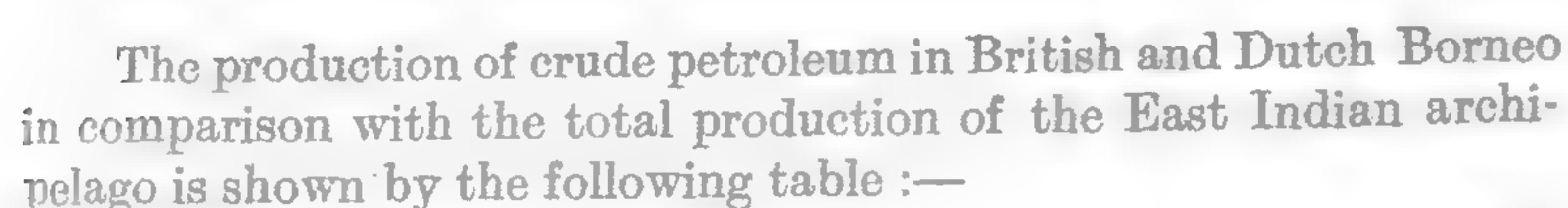
The exploration for oil extended to British North Borneo, where the Bombay-Burmah Trading Co. obtained the Korszki concession, and drilled with varying success in British North Borneo, Brunei, Sarawak, and on Labuan Island. The firm of Buiju also drilled on Labuan without success.

PRODUCTION.—In spite of the development of new fields in Ceram and in Sumatra, the island of Borneo has con-

tributed since 1910 an increasing proportion of the total output of crude petroleum in the Dutch East Indies. In 1910 Dutch Borneo produced 42 per cent. of the total production of the Dutch East Indies; in 1920 its percentage had risen to 61.5 per cent. Taken together, British and Dutch Borneo in 1920 yielded 63.8 per cent. of all petroleum won in the entire archipelago.



*Published by permission, the director, U. S. geological survey. This paper is one of a series of critical reviews which the author is making of geologic and geographic literature pertaining to foreign oil fields.—Editor.



PRODUCTION OF CRUDE OIL IN BORNEO AND THE EAST INDIES.

	Dutch Borneo*	British Borneo,	East Indies (incl.
	Metric Tons.	Metric Tons.	British Borneo), Metric Tons.
1910	.. 633,472	—	1,500,245
1911	.. 814,707	—	1,670,568
1912	.. 672,438	5,534†	1,524,939
1913	.. 766,687	30,562†	1,564,785
1914	.. 866,718	65,185†	1,634,405
1915	.. 893,890	67,000†	1,710,443
1916	.. 957,395	90,067†	1,820,251
1917	.. 869,262	77,604†	1,870,214
1918	.. 999,426	72,511†	1,836,712
1919	.. 1,372,006†	85,695†	2,245,562
1920	.. 1,455,228	146,729†	2,512,049

POLITICAL DIVISIONS.—Politically, the control of the island of Borneo is divided between Great Britain and the Netherlands.

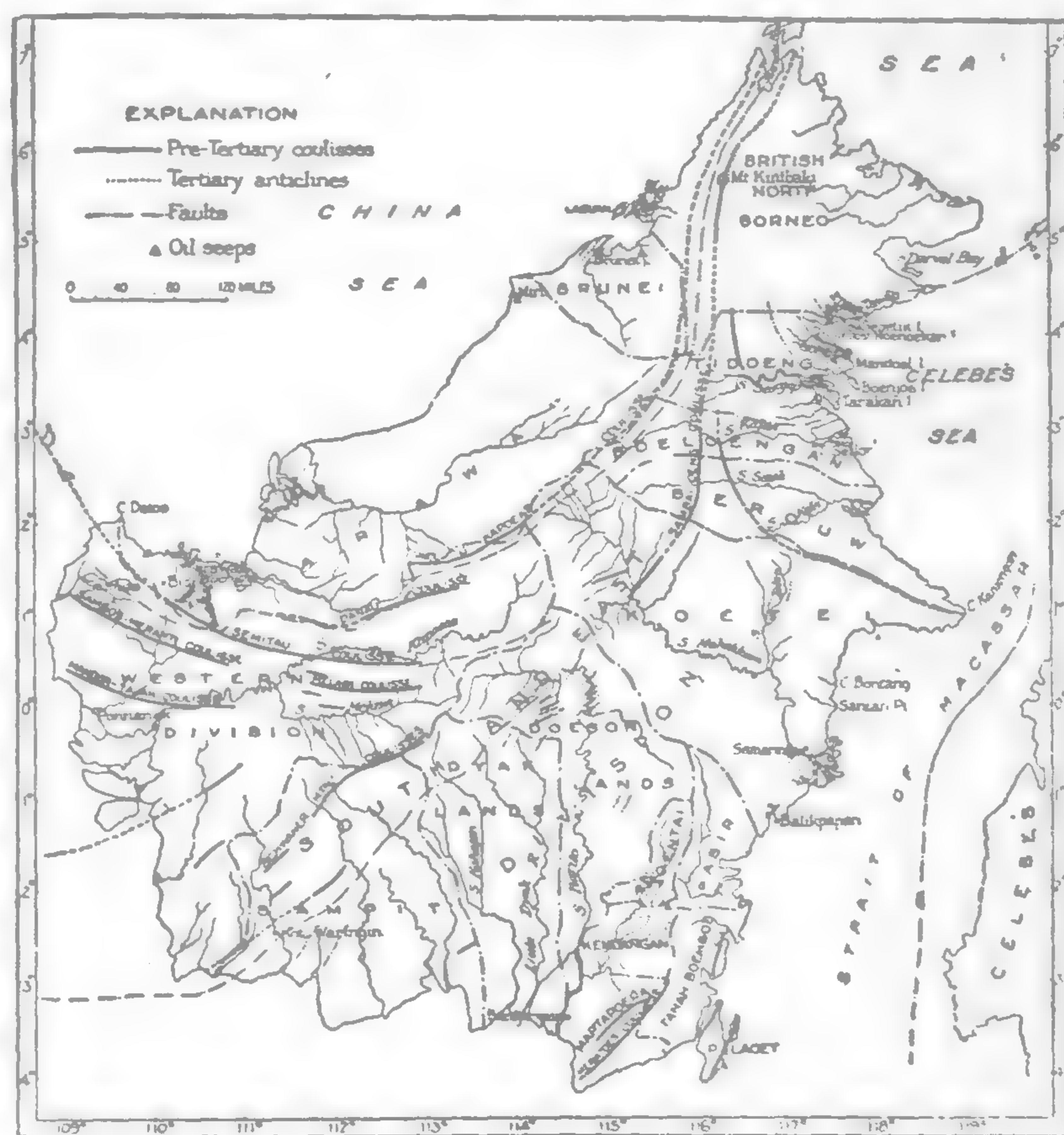
The British portions of Borneo constitute a little over one-fourth of its entire area. These consist of the rajahship of Sarawak, a protectorate of Great Britain; the sultanate of Brunei, under the administration of a British resident; British North Borneo, under the jurisdiction of the chartered British North Borneo Company; and the island of Labuan, which is incorporated with the Straits Settlements. The governor of the Straits Settlements is *ex officio* high commissioner of Brunei and British agent for British North Borneo and Sarawak.

Dutch Borneo is divided politically into the residency of the western division (Wester Afdeeling), and residency of the south and east division (Zuid- en Ooster Afdeeling). Both residencies are subdivided into a number of native sultanates and principalities, each under the supervision of a Dutch assistant resident or a *contrôleur*.

The hills which surround the mountain ridges form aggregates of small, rounded or extended hills, many of which are very steep. Their average height does not exceed 200 or 300-ft., except close to the divides where they are higher and give the country a more mountainous appearance. Isolated outliers of the hill-country appear in the plains.

The hill-land is succeeded by low-lying plains, which, especially in South Borneo, are of great extent. The dry plains are succeeded in turn by swamp-land at the deltas of the large rivers and along the coast.

AREA GEOLOGY.—The known geology of the island of Borneo is complicated. According to the Abendanon map, only three areas of Dutch Borneo, widely separated, have been thoroughly investigated geologically. One comprises the greater part of the



Tectonic Map of Borneo

western division of Borneo, which was explored by Molengraaff in 1893-1894. The second lies southeast of a line running from Bandjermasin to Cape Santang. The third area occupies the two prominent peninsulas which mark the northeast coast of Dutch

*Jaarboek van het Mijnwezen in Ned. Oost-Indië, Batavia.

†Annual reports, Royal Dutch Company.

†Goenceng (pronounced "goonceng") in Malay means "mountain."

Borneo. About three-fourths of the remainder of the Dutch possessions is known through reconnaissances only, and several extensive areas are geologically unexplored.

The observations which have been made of the British portions are for the most part disconnected and uncorrelated. In the absence of a detailed geologic survey of any part of British Borneo, the isolated observations leave many problems unsolved. Fortunately the more complete knowledge of the Dutch area is of considerable help in interpreting the geology of the British provinces of Borneo.

The core of the axial mountain range, which separates Dutch from British Borneo, consists of granites, gabbros, and intensely folded schists. These rocks have been referred to the Archean, but their precise age is undetermined, and some of the schists may be metamorphosed sediments of a much later geologic date. The ligneous rocks probably belong to more than one period.

The "old slates" consisting of bluish phyllites and siliceous slates of undifferentiated Paleozoic or perhaps Mesozoic (?) age flank the principal granitic and crystalline axis of the island. The Upper Kapoeas chain, which extends almost east and west between western Borneo and Sarawak, consists of these rocks.

rocks have not been recognized *in situ* in British Borneo. In the western division of Dutch Borneo the Cenomanian stage (Middle Cretaceous) occurs to the east of Sintang. The Cretaceous formations of the western division extend in an irregular bifurcated belt in a generally easterly direction from the upper Sekajan (or Kapoeas) valley to the foot of the Müller range. Cenomanian limestones and crystalline schists, which are considered to be metamorphosed Cenomanian sediments, form the core of the Meratoes mountains. The Alino and Waringin shales of South and East Borneo are referred to Senonian stage of the Upper Cretaceous; but older rocks are in all probability included. These flank on both sides the metamorphosed Cenomanian rocks of the Meratoes mountains.

Mesozoic (?) granites and contact-metamorphic rocks form the south slopes of the Schwaner mountains. Granite massifs of Mesozoic age may be traced from Mandor to Tajan on Soengei * Kapoeas.

Volcanic rocks appear chiefly in the Müller mountains. In the western portion of the range, andesites, quartz-andesites, and porphyrites predominate. The central portion consists of terraced table mountains, separated by deep valleys. The table



View of Main Plant of the Royal Dutch Petroleum Co. at Balikpapan, Showing the Buildings devoted to Refining the Crude Oil into Benzine, Kerosene and Fuel Oil. Capacity, 2,000 tons per day

Phyllites occur on the upper Berouw or Kelei river and the lower Kajan or Boeloengan river, and granites on the upper Segah and Kelei Rivers, where they form the cores of the so-called "Sambalioeng coulisses."

A zone of limestones, 20 to 40 miles in width, extends in the foothills of British Borneo from longitude 112° east (Greenwich) nearly to Marudu bay. These were regarded by Posewitz as belonging to the Carboniferous, but the identification of the fossils upon which this reference is based is by no means complete. It is probable that some indeed if not all of the so-called "Carboniferous limestones" of Posewitz and Tenison Woods, is of Mesozoic age.

Immediately south of Kapoeas range the "Danau formation" occurs, faulted down against the Paleozoic slates. Fossils, especially *Radiolaria*, found in the "Danau formation" indicate that it belongs to the Jurassic, but it is possible that older Mesozoic beds are included in it. No corresponding radiolarian beds have so far been described as occurring in British Borneo.

Fossils of the Lias epoch (Lower Jurassic) were found in a shale formation in the Sambas district of the western division of Dutch Borneo, immediately south of Sarawak. The Liassic shales are overlain by a sandstone and shale series, containing fossils characteristic of the Dogger epoch (Middle Jurassic). At the western end of Sarawak fossils of the Middle Oölite (Upper Jurassic) have been found in a limestone formation. Cretaceous

mountains consist of thick beds of tuff, in places alternating with horizontal or almost horizontal flows of andesite or basalt. In the eastern part of the Müller mountains acid rocks, chiefly rhyolites, quartz-andesites, and mica-quartz-andesites, predominate. A line of porphyrite cones extends in an almost east-and-west direction on the gently sloping sandstone plateau which forms the northern slope of the Schwaner mountains. A zone of andesite and dolerite hills, about 11 miles wide, bearing about N. 80° E. occurs in the extensive granite area of Sambas.

In Dutch Borneo, Tertiary sediments occupy the middle portions of the Kapoeas river and Melawi river valleys. The greater part of the south and east division of Borneo is underlain by Tertiary sediments, intruded locally by Tertiary and younger igneous rocks. Quaternary deposits occupy the coastal areas of the south and west coasts and river valleys of south-eastern Borneo.

The Tertiary region of British Borneo forms a coastal zone, about 60 to 100 kilometres (36 to 62 miles) wide.

TECTONICS.—*General Discussion.*—Two well-defined faults bound on the north and south a "West Borneo horst" of pre-Tertiary phyllites, slates, and crystalline rocks. This horst constituted, in the opinion of Van Es, a buttress against which crustal movements were exerted with little effect upon it other than slightly increasing its elevation.

*Soengei in Malay means "river."

On the northwest coast, in British Borneo, and along the east and south coasts of Dutch Borneo are areas of Tertiary sediments which have been considerably affected by Tertiary folding movements.

It is evident from the stronger folding which the Lower Miocene, Oligocene, and Eocene beds of the south and east division show as compared with the Upper Miocene and Pliocene beds that a period of folding took place between the deposition of the Lower and Upper Miocene. This is particularly evident in the vicinity of Balikpapan Bay. The Miocene folding was followed after an interval by an Upper Pliocene folding along the same axes. In contrast, a large part of the Tertiary of the western division of Borneo was left almost undisturbed by both the Miocene and the Upper Pliocene folding.

PRE-TERTIARY STRUCTURE.—The structure of Borneo shows an intimate relation to that of its neighboring islands. The inner geanticlinal arc of the Philippine islands extends southwards through the Borneo Horst, in a broad curve nearly parallel to the west coast of British Borneo from the northernmost point of the island. From central Borneo the direction changes gradually first to the west and then to the northwest to Cape Datoe, and continues in the North Notoena islands.

The existence of the geanticlinal arc is evidenced in Borneo by the occurrence of a series of coulisses. As has been explained in a previous paper,* the name "coulisse" is applied to one of a series of structural ridges arranged *en échelon* on the earth's surface, like the wings of the stage (French, *coulisse*) in a theatre. Such features are formed by folding of the stratified rocks and the intrusion of masses of igneous rocks, followed by erosion. These echeloned ridges form a prominent part of the physiography not only of the Dutch East Indies, but of the Malay peninsula, Burma, French Indo-China, and the Philippine islands as well.

The coulisses of Borneo show in their arrangement a phenomenon which has been noted in less degree in Java and Sumatra and in greater degree in the Philippine islands, namely a branching out or virgation of their members. Though in the north of Borneo all coulisses appear to be compressed into a narrow zone and to follow generally a north-northeast direction, in the south they radiate fanwise. The most easterly members curve to the southeast and turn in the direction of Celebes, and probably are continued in the mountain ranges of that island. The northern portions of the Meratoes and Poeloe † Laoet coulisses trend north and south, but the southern portions curve to the southwest, and continue in the coulisse of the Karimoen Djawa island, and probably certain of the coulisses of eastern Sumatra. The central series of coulisses, to which the Schwaner mountains belong, trend from southward to southwestward, to westward, and finally to northwestward, and continue in the Banka-Malacca horst. The Mandor-Tajan, the Sambas-Meranti, the Semitau, and Danau coulisses have the same curvature but with a shorter radius, and may be following through the Anambas and Notoena islands to the eastern coastal range of Annam. The Upper Kapoeas coulisse is the innermost of these arcs and has in consequence the shortest radius.

TERTIARY ANTICLINES.—Tertiary anticlines have been noted in several widely separated localities of Borneo. Our present knowledge of the geology of the island is not sufficiently advanced to permit any exact correlation of their axes. Their close parallelism with main tectonic lines of the island is notable.

A group of anticlines whose axes trend northeastward has been noted on the peninsula of Brunei. A second series, apparently a continuation of the first, crosses the island of Labuan and the Klias peninsula opposite Brunei. For anticlines, whose axes trend northeastward, occur to the southeast and east of Kota Waringin. The anticlinal axes parallel the Schwaner mountain coulisse and the Schwaner mountain fault. Similar groups of

Tertiary anticlines cross the upper valleys of Kahajan and Barito rivers, paralleling with their axes the tectonic lines of the Schwaner mountains.

The Meratoes and Poeloe Laoet coulisses in southeastern Borneo are paralleled north of Bandjermasin by a series of Tertiary anticlines whose axes bear north-northeastward to northward. This trend is continued by the Balikpapan anticline, by a group of four anticlines which cross Mahakkam river above and below Samarinda, and by two anticlines in the upper valley of Soengei Telen.

The anticlinal axes which cross Tarakan and Sebetik islands to the mainland and continue into British territory trend from southeast to northwest. This trend is parallel to the observed and assumed trend of the coulisses of this region.

FAULTS.—The two principal faults of the island of Borneo which bound the West Borneo Horst are longitudinal with regard to the main tectonic lines of the archipelago. The first of these, the Upper Kapoeas fault, bounds the Upper Kapoeas mountains on the south side and separates the Paleozoic phyllites of which the mountain range is composed from the Mesozoic rocks of the Danau coulisse. The second fault line, with which volcanic rocks are associated, bounds the Schwaner mountains on the south. Between the two main faults lies a parallel dislocation upon which the mountains have been formed by eruption.

Two faults, longitudinal to the main axis of the island in one extremity, and transverse in the other, have been assumed. Macassar strait is believed by Van Es to conceal a fault-line which runs northward from Java Sea and curves northeastward into Celebes sea. A second fault has been traced from Pt. Elphinstone, through the Sulu islands of the Philippine archipelago into Mindanao! Though transverse at its southern end to the principal coulisses and faults of Borneo, in the Philippine islands it is longitudinal with respect to the main tectonic axes of Malaysia in general.

VULCANISM.—Probably as a consequence of the fault movements described above, igneous eruptions have occurred along certain faults. These date probably to Miocene time, when the folding in other parts of the island was strongest.

OIL-BEARING AREAS.—There are at present three important oil-producing areas on the island of Borneo. The first is the Koetei district, extending from the mouth of Mahakkam river southwards toward Balikpapan bay. The second is the Tarakan district, situated on Tarakan island off the east coast, about 80 miles south of the British-Dutch frontier. The third is the Miri district, on the west coast of Sarawak, about 150 miles south of Brunei bay.

THE KOETEI OIL DISTRICT.—*Location and Extent.*—The Koetei oil district lies in the Landschap of Koe'tei, the southernmost of the subordinate divisions of the Afdeeling of Koetei and the northeast coast, residency of the south and east coasts, Dutch Borneo. It includes the Sanga Sanga field in the Louise concession; the Sambodja field in the Nonny concession, and the Moeara field in the concession of the same name.

PHYSIOGRAPHY.—The Mahakkam or Koetei river, flowing eastward, divides at a point about 25 miles from the coast into three distributaries, the Moeara ‡ Djawa to the south, the Moeara Bajor to the southeast, and the Moeara Berau to the north. East of Moeara Djawa and Moeara Berau there is a broad swampy delta, overgrown by mangroves, and inhabited by a few natives. West of those rivers a peneplain, whose hill-ridges do not exceed 200

*Redfield, Arthur H., "The Djambi Oil Field of Sumatra," Eng. and Min. Jour., Vol. 112, No. 24, pp. 939-943, New York, December 10, 1921.

†Poeloe in Malay means "island."

‡Moeara (pronounced Mooahra) in Malay means "river mouth." Moeara Djawa may be translated "Java Mouth" or "Java Pass."

feet in altitude, extends for a considerable distance. Farther west, beyond Pelarang, the peneplain merges into a low hill-country whose maximum elevations are about 500 feet.

The peneplain west of Moeara Djawa and Moeara Berau, about 12 miles wide, cuts across folded Tertiary sediments which strike about N. 20° E. The principal streams of this region cut the folds at about right angles; the tributaries run parallel to the folds.

AREA GEOLOGY.—The coastal region of Koetei is underlain by a zone of folded Tertiary sediments, about 60 miles wide, which consist principally of post-Eocene formations, chiefly Miocene. The occurrence of Eocene rocks, so far as is now known, is restricted to the middle portion of the Mahakkam valley, and their geologic relation to the later Tertiary deposits is not wholly determined.

Aquitanian and Lower Burdigalian (Lower Miocene) bed are exposed in the cores of the eroded antilines. They occur, 4,900 feet thick, in South Koetei, west of Balikpapan bay, and in the Lower Mahakkam valley. In the vicinity of Cape Bontang and Santan point only a small part of these stages not over 820 feet in thickness, is exposed on the surface.

Upper Burdigalian and Vindobonian formations occur flanking the Lower Miocene beds near Balikpapan bay, on the lower Mahakkam, and in Bontang. The Pontian (uppermost Miocene) beds constitute the uppermost beds of the synclines, below the recent accumulations of surface material.

STRATIGRAPHY.—The Tertiary of eastern Koetei consists of a very thick series of sediments, whose oldest members were deposited probably in the transition stage between Lower and Upper Tertiary, while the youngest members border on the Pliocene. They were apparently laid down under delta conditions and changes of facies are numerous.

The Eocene is represented on the middle Mahakkam by the "plateau sandstone." This formation consists at its base of quartz-conglomerates, overlain by quartz-sandstones, shales containing plant impressions, and coal seams. The evidence of fossils, as well as its lithologic similarity to the Eocene formations of southeastern Borneo, places the "plateau sandstone" in the Eocene. This formation is overlain unconformably by orbitoid limestones of Aquitanian (lowest Miocene) age.

For the greater part of Koetei no detailed stratigraphic division of the post-Eocene has been made. Rutten has subdivided the formations of Balikpapan into stages, and Jezler has correlated the formations of the lower Mahakkam with Rutten's subdivisions. But the numerous changes of facies even in the same area make correlation difficult, and for most of Koetei only a rough division of the post-Eocene beds into three major stages is feasible.

The oldest Tertiary sediments appearing on the lower Mahakkam belong to the Aquitanian stage. These formations, named by Jezler the Prangat beds, consist of 1,100 metres (3,600 feet) of limestones, shales, concretionary clays, and orbitoid limestones. They contain at Sanga Sanga traces of natural gas without petroleum.

The Prangat beds of the lower Mahakkam valley are correlated by Jezler with the Pamaloeang beds of Balikpapan bay, described by Rutten. The latter are composed of gray and brown, hard concretionary shales, indistinctly bedded and in places marly; thin-bedded gray sandstones containing scales of coal between the bedding planes; Aquitanian (orbitoid) limestones; and impure limestones with corals. The almost total absence of coal seams is a distinguishing mark of this stage. The thickness of the Pamaloeang beds of Balikpapan bay is about 1,500 metres (4,290 feet).

The Prangat beds are conformably overlain by the Sanga Sanga beds which belong to the Burdigalian stage of the Lower Miocene. The latter are composed of about 1,300 metres (4,260 feet) of sandy clays and shales and impure limestones. The Sanga Sanga beds contain the oil horizons of Sanga Sanga and Sambodja, and correspond to the Poeloe Balang beds which form the oil-bearing formations of Balang island in Balikpapan bay.

In the Poeloe Balang strata, of Burdigalian (Lower Miocene) age, shales are few; sandstones are numerous. The shales are hard and gray; the sandstones vary from soft to hard. Extensive limestone and marl beds occur. Numerous seams of black, lustrous coal, breaking with a conchoidal fracture, and without inclusions of mineral resin, occur.

The Moeara Djawa beds of Vindobonian (Upper Miocene) age conformably overlie the Sanga Sanga beds on the lower Mahakkam. These consist of light-gray clays and sandstones, attaining a thickness of about 800 metres (2,640 feet). This stage contains the oil of Moeara Djawa.

The Moeara Djawa beds are considered by Jezler to correspond with the Mentawir beds of Balikpapan bay. These consist of gray sandstones and clay, with interbedded lignites. The associated lignites are somewhat resinous.

The Pontian stage (uppermost Miocene) is represented in the Sanga Sanga field by the Kembang beds, which are composed of 800 metres (2,640 feet) of gray and red sandy clays, ferruginous sandstones, and dull black to brown lignites containing resin. This is the oil-bearing stage of Balikpapan bay.

The Pliocene is not represented in the formations of Koetei. The Tertiary sediments are overlain unconformably in places by Quaternary sediments of varying thickness, up to 400 metres (1,320 feet).

The post-Tertiary deposits of eastern Koetei consist of coral-line sands along the coast and on the offshore islands; clays, shaly clays, sands, and gravels in the river valleys; and perhaps moor formations in the deep swamps which border the rivers. Local deposits of calcareous tuff occur.

To be concluded in March Number

Far Eastern Timbers (continued from page 135)

Group.	Compressive strength (parallel to grain), lb. per sq. in.	Woods included in Group
III	3,400 to 3,600	Slippery elm, loblolly pine, hackberry, poorer qualities of white and red oaks shortleaf pine, tupelo gum, western hemlock, western larch, black cherry, white elm, cypress, tamarack.
IV	2,400 to 3,400	Redwood in bending, red gum, sycamore, black ash, white fir, red spruce, eastern hemlock, balsam fir, common catalpa black spruce, sugar pine, white pine, white spruce, western yellow pine, Norway pine, lodgepole pine, chestnut, cedar, aspen, silver maple.
V	Below, 2,400	Basswood, hardy catalpa.

The Bamboo

It is very difficult to obtain any information of use to engineers concerning the bamboo. There are about 33 different varieties and the number of uses to which the bamboo is put in China is legion. The engineer seems to employ it only as struts and in places where considerable bending stresses must take place. It may reasonably be asked why no scientific data of use to engineers concerning the physical properties of bamboo has been included in this paper. A little examination of the problem will, however, reveal many difficulties.

Suppose that we obtain some specimens of bamboo and subject them to the ordinary bending tests. At once, we find difficulties in connection with the measurement of the specimens. The appearance of the bamboo suggests that it is circular, but even if we discover (what is very unlikely) some specimens truly circular on the outside, there would still be the difficulty in determining the interior dimensions of the specimen.



View from Gothenburg Free Harbor

The Jubilee Exhibition at Gothenburg, Sweden, 1923

SWEDEN, which in the seventeenth century was one of the greatest powers of Europe, stands to-day among the leaders in peaceful cultural and material development. She is a highly organized country and justly famous for her achievements on different spheres of human activity. Her scientists have made important contributions to theoretical science and its practical applications, her educational system is probably the most advanced and efficient in the world. Her trade and industry were early important and Swedish products are to-day known all over the world for their high quality and excellent workmanship. The present world-wide economic depression has, of course, brought on hard times also for Sweden's industrial and commercial life. In the case of Sweden the difficulties



Bird's-eye View of the Exhibition



View from the Port of Gothenburg

have been aggravated by the high value of the Swedish currency, making the Swedish export products very expensive to the foreign buyer.

However the conditions are improving and Sweden has every chance to emerge practically intact in its economic functions from the prevailing crisis.



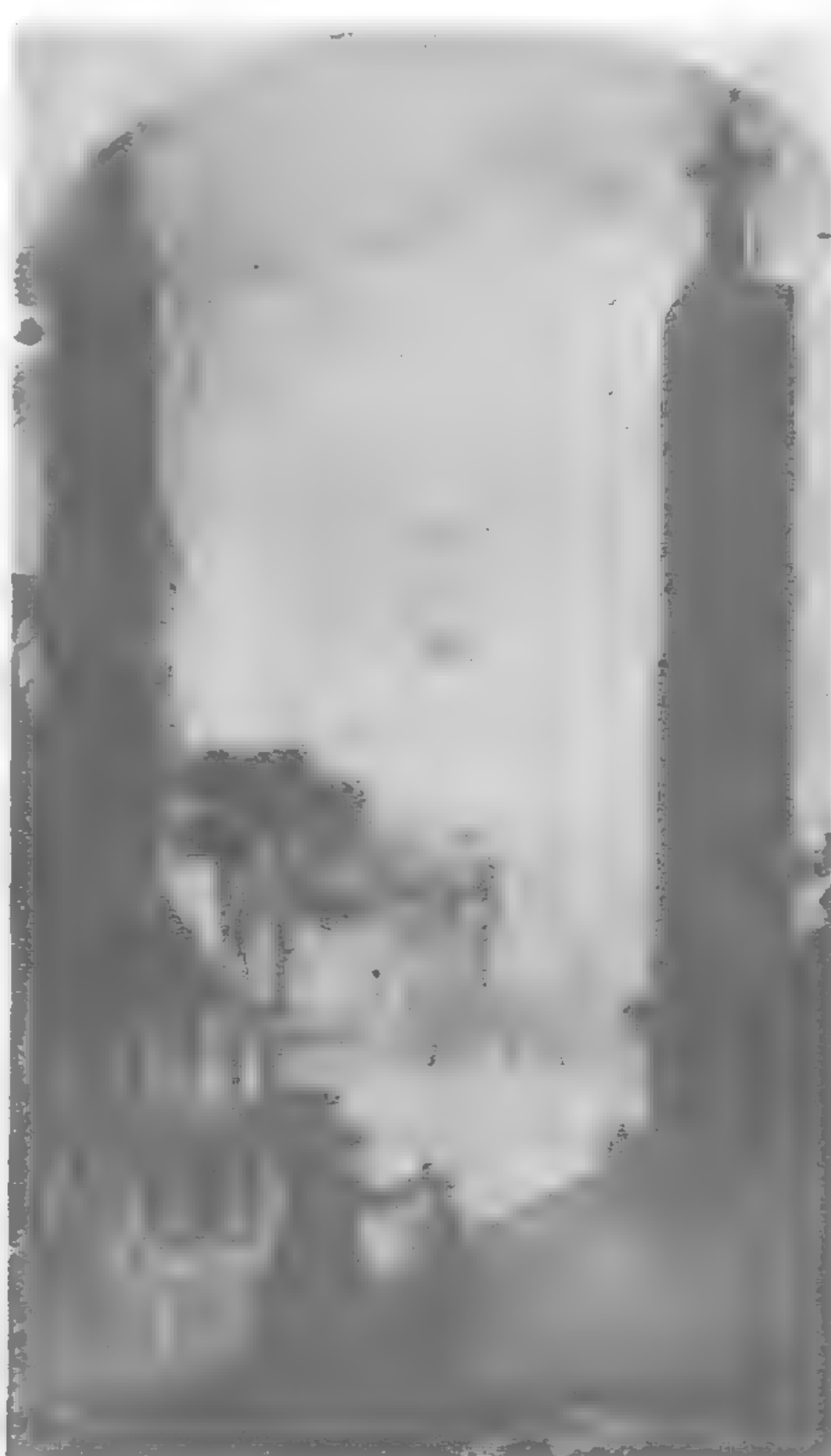
Courtyard in Front of Entrance
(From an etching by Hj. Molin)

One of the leading factors of Sweden's industrial life is the vast natural resources within her boundaries. There are enormous areas of forest-bearing land, iron-mines yielding the best raw material found anywhere, a rich soil suited for extensive agriculture, large stores of waterpower, which have already been utilized to a considerable extent. Roads, railroads and waterways make all places of commercial importance easily accessible. With a population of about 6 millions Sweden has 15,154 kilometres of railways as compared with about 6,000 kilometres in China.

An opportunity to study this interesting country will be given when the city of Gothenburg—the great shipping centre of Sweden—is holding between May 8 and September 30, this year, a historical and industrial exhibition in commemoration of its 300th anniversary. The object of the exhibition is to give a picture of the development of Gothenburg and



The Memorial Hall



View from "Langa Garden." Memorial Hall in Background
(From an etching by Hj. Molin)



Perspective View of the Art Gallery from "Gotaplatsen"
(From an etching by Hj. Molin)

Western Sweden since the foundation of Gothenburg three centuries ago by King Gustavus Adolphus II and further to show what the industries of all Sweden has to offer the world markets.

Below follows a short description of the various exhibitions.

I. Historical Exhibitions

These comprise a general historical exhibition intended to show the general development of Gothenburg and Western Sweden from the time of the first human settling to modern times. Special exhibitions will picture the historical development of shipping, including shipbuilding, navigation, lighthouse and pilot service, harbors and naval defense. The development from handicraft to modern industrial production, history of domestic and foreign trade, historical development of fishery and of sports will all have separate exhibitions.

(Concluded on page 95)



Main Entrance to the Automobile Exhibition



Automobile Exhibition
The Restaurant Court

Ryerson's Steel-Service Plants

The Record of Eighty Years of Efficiency

THE firm of Joseph T. Ryerson & Son, soon to celebrate its 80th anniversary, ranks among the foremost of the old established concerns

of Chicago. As they enter a new era of progress and advancement, it may be interesting to pause a moment and consider the development and growth of over three-quarters of a century.

Mr. Joseph T. Ryerson arrived in Chicago in 1842 as the accredited agent of Wood, Edwards and McKnight, Pittsburgh iron masters. Since the meager railway systems of the day did not extend very far westward, he had to travel from Philadelphia to Columbia, Pa., by railroad, stage coach over the mountains to Pittsburgh, stage to Cleveland, boat to Detroit, rail to Jackson, Michigan, stage to St. Joe and boat to Chicago, making the trip in eight days.

He rented a store just west of the corner of Clark and Water Streets, a small two-story brick building, for \$200 per year. A \$20,000 stock of iron was soon received from Pittsburgh and the business began.

The next year Mr. Ryerson moved his store to 90 Lake Street, just opposite the old Tremont House, which stood on the southeast corner of Dearborn and Lake Streets. A little later he also established a branch store at Urbana, Illinois.

In 1844 he secured land at 74 Lake Street and erected a two-story building, stocking it with heavy and light hardware in addition to the heavy iron and steel products from Pittsburgh.

In 1852 purchased a dock lot with 80-foot front on the river at 218-224 South Water Street. His friends at that time told him he was making a mistake to go so far out in the prairie, as this was at least two blocks west of the business

centre. In this location his business grew and prospered until October 9th, 1871, when the great Chicago fire reduced

his building to ashes and his stock to a conglomerate heap of molten metal. The burned store was rebuilt March 15th, 1872.

About ten years later property was purchased at 18 to 22 Milwaukee Avenue, running through to Clinton Street, and a three-story office and warehouse building was erected. Soon two more stories were added to the building and later a five-story

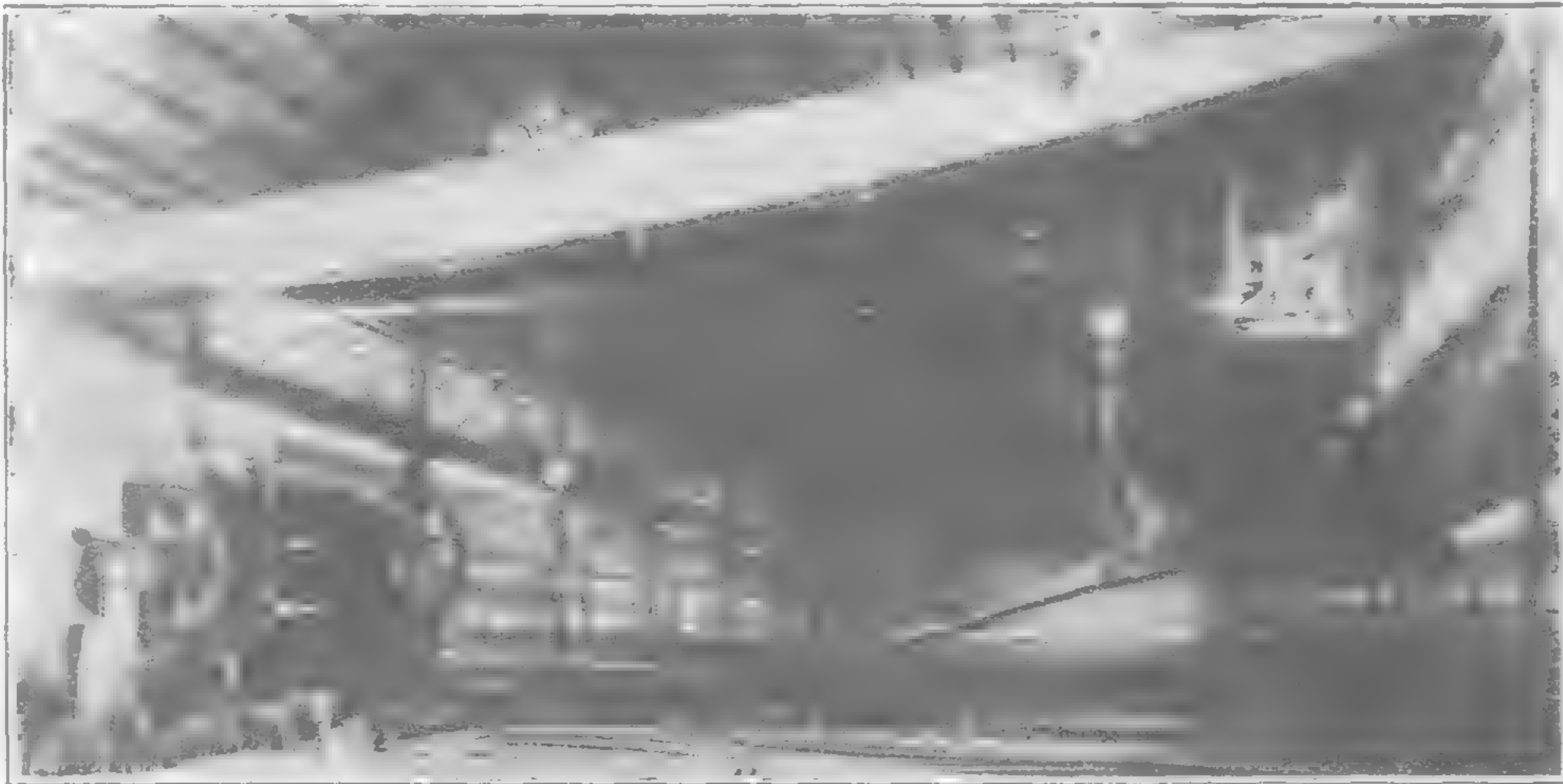
addition was erected on each side of the main building.

In 1908 still larger quarters were necessary, and the first buildings of their present plant were erected. Here they have gradually added to the buildings and property until to-day the Chicago plant occupies a ground area of over 19 acres, with nearly a million square feet of floor space.

In 1914 the Company purchased the W. G. Hagar Iron Co., increased the plant capacity 100 per cent. (present area about 160,000 square feet) and began to serve the great southwest territory direct from St. Louis. In 1915 the New York plant was built (present area approximately 175,000 square feet). In 1917, when war was declared with Germany, the Detroit plant had just been completed. It was offered to the government, but as the war department did not need it at that time, a large stock of steel was laid in and the Detroit plant began to serve the

trade in its territory. (Present area about 135,000 square feet.) The warehouse division of the Ferguson Steel & Iron Co. at Buffalo was purchased in 1919, with floor area of 170,000 square feet.

The firm of Joseph T. Ryerson & Son now serves the entire country from coast to coast from five well placed and complete steel-service plants. Offices in principal cities complete the organization.



Typical Views of Ryerson Steel-Service Plants at Chicago, Detroit, St. Louis, Buffalo and New York

Large Suction Dredger for Bengal

MESSRS. Wm. Simons & Co., Ltd., Renfrew, launched on October 6, 1922, the large cutter suction pump reclamation dredger *Cowley*, which they have constructed for the government of India, and which will be employed in dredging the shallow rivers in the Bengal province.

The hull of this vessel having four complete bows, is of most unique form, designed specially for opening up new waterways and improving the depth of shallow canals or rivers; the dredger is able to cut a canal or channel about 45-ft. wide at bottom in one cut. Suction frames are led through the three open wells created at the fore part of the ship by the formation of the bows. Each suction frame has two suction orifices, and carries two rotary cutters arranged to work in advance of the suction nozzles for disintegrating clayey material which would otherwise be unsuitable for suction pump dredging. Each pair of cutters is driven by bevel and spur gearing from an independent four-cylinder tandem compound engine. The suction frames are designed to dredge to a depth of 30-ft. under water and are controlled by steam hoist gear and wire rope tackle in such a manner that the frames may be raised or lowered independently or conjointly as required. The two centrifugal dredging pumps are each driven by an independent set of vertical triple-expansion engines. The pumps deliver the material dredging direct through a floating pipe line 600-ft. in length and 42-in. diameter. The pipe line is raised by a terminal pontoon to a height of 25-ft. above water level and the material is finally discharged over the canal bank to a distance of 150-ft. from the centre of the terminal pontoon.

Another feature is that the dredger is fitted with three propellers each driven from a separate set of vertical compound surface condensing engines of sufficient power to obtain a speed of eight knots. The engine room outfit includes independent condensing plant, automatic feed pumps, bilge pumps, service pump, filters, evaporators. Steam is supplied by four Babcock and Wilcox watertube boilers constructed for a working pressure of 180-lbs. per

square inch, and fitted with forced draught. An outfit of machine tools is provided capable of dealing with minor repairs. The floating discharge pipe line consists of twelve circular pontoons, each carrying a 42-in. diameter pipe 50-ft. long coupled together by special ball and socket connections.

The vessel has been constructed under the supervision of Messrs. Sir J. H. Biles & Co., Glasgow and London, naval architects to the Indian government.

As the vessel left the ways the naming ceremony was performed by Mrs. Brown, wife of the chairman of the company.

A 600-Ton Blast Furnace

THE No. 3 blast furnace built by the Riter-Conley Company for the Pittsburgh Crucible Steel Company at Midland, Pa., in 1919, is modern in every respect, and capable of producing 600 tons daily.

The following are the principal dimensions:—Hearth 18-ft. 0-in. in diameter, bosh 22-ft. 6-in. in diameter, bosh angle 7 degrees and 30 minutes, stock line 16-ft. 0-in. in diameter, large bell 12-ft. 0-in. in diameter, height of furnace 92-ft. 0-in. from centre line of iron notch to top ring.

Furnace has cast steel hearth jacket with cast iron cooling staves, eight columns, twelve tuyeres and revolving top. Skip incline is of the cantilever type and is entirely free from furnace. Cleaning system consists of a dust catcher, 25-ft. 0-in. in diameter, and 35-ft. 0-in. high, and a dry cleaner for cleaning all gas. There are three stoves 23-ft. 1-in. in diameter and 105-ft. 0-in. high, with 3½-in. checkers, stove stack is 7-ft. 6-in. by 200-ft. 0-in. A passenger elevator affords easy access to top of stoves and furnace. The McClintic-Marshall Products Co. is the foreign department of the Riter-Conley Co.

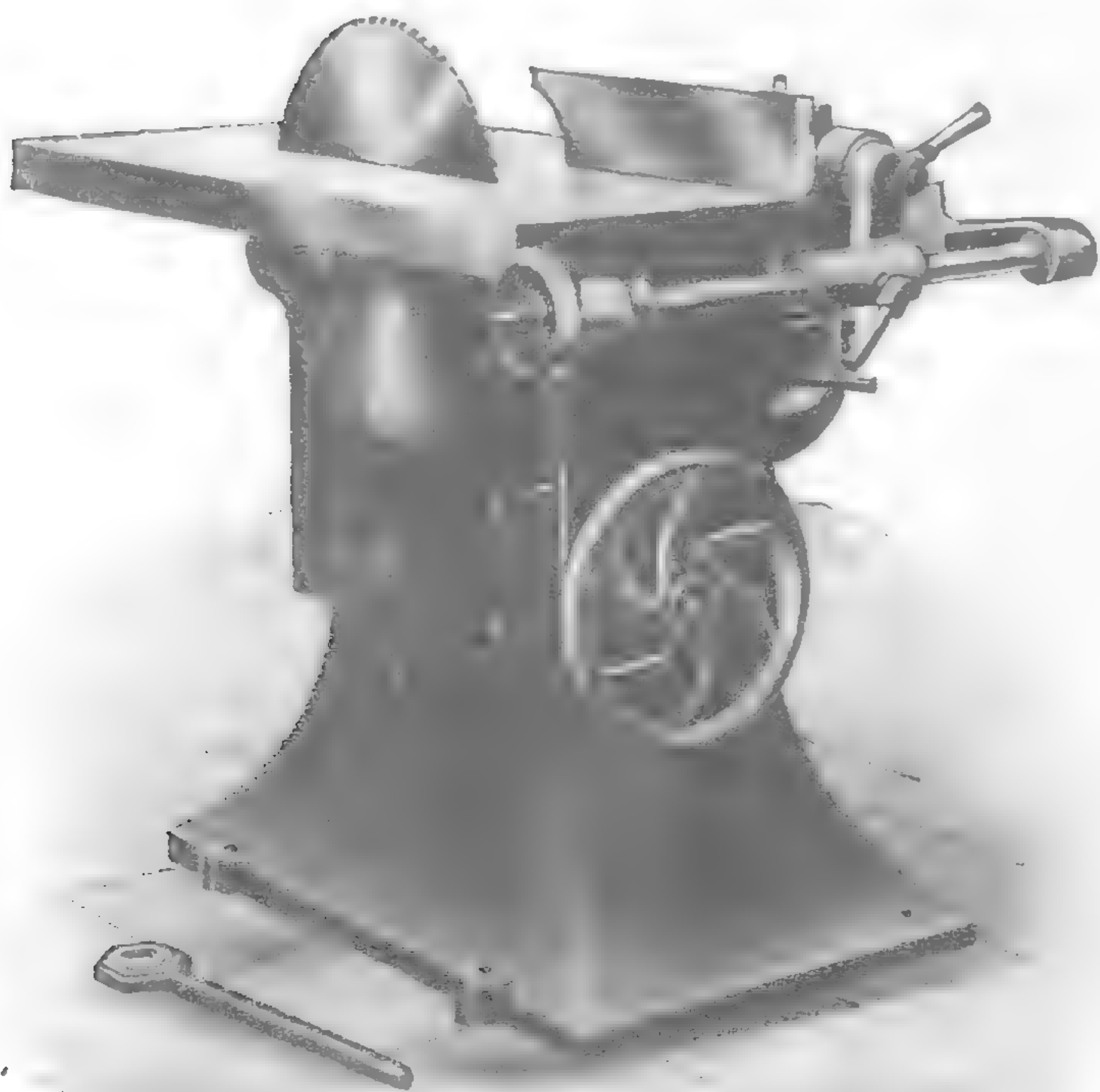
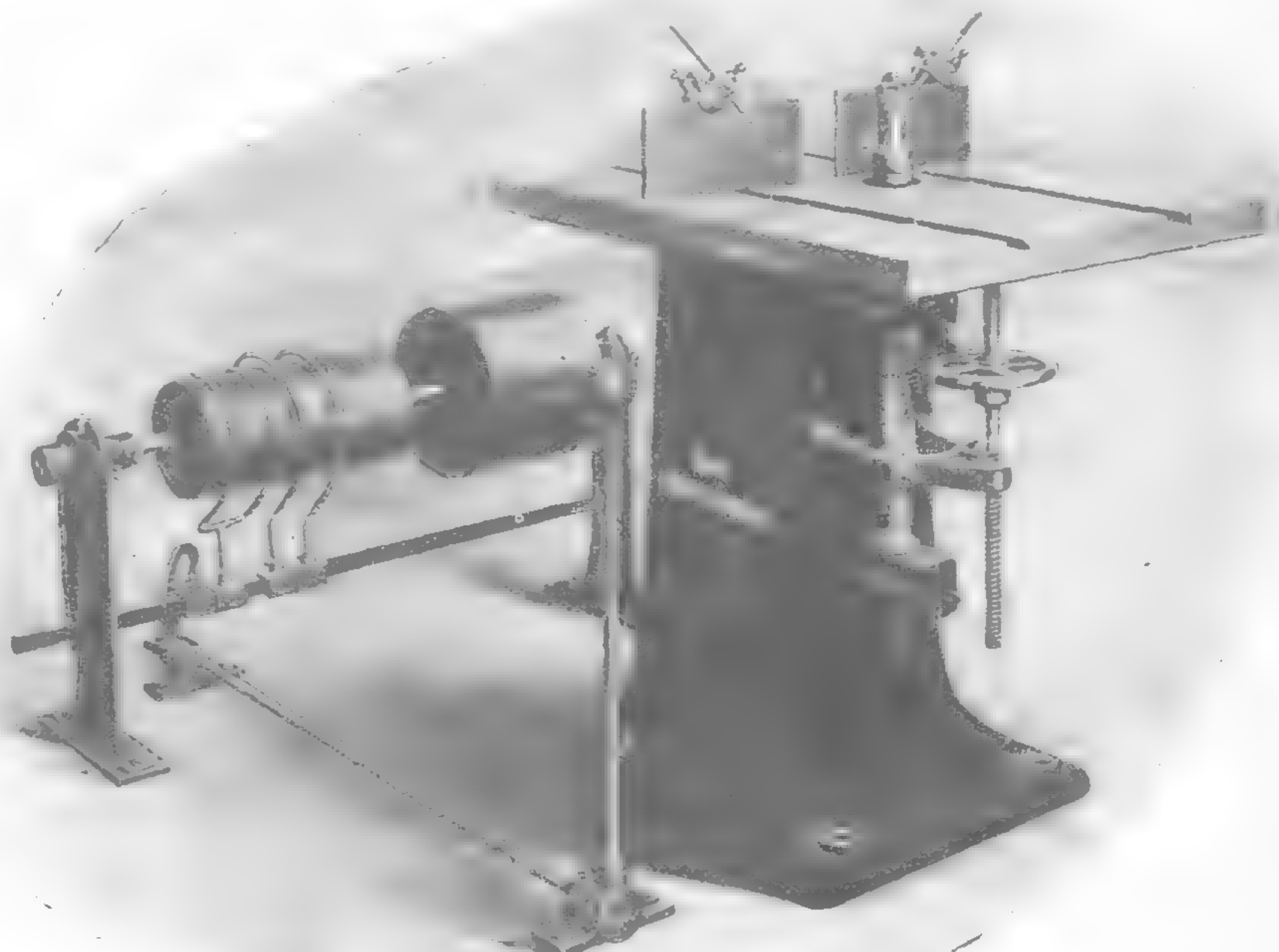
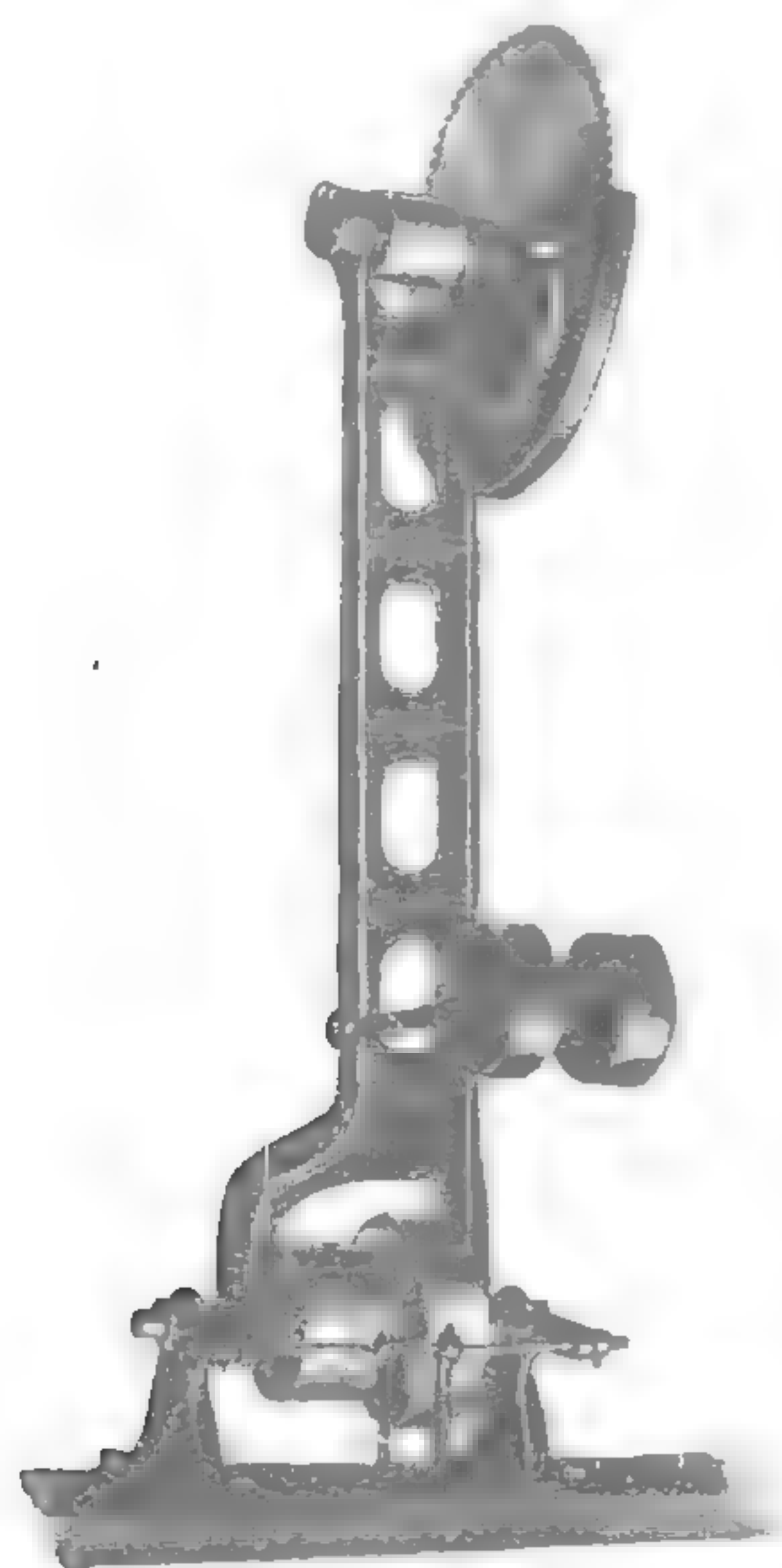


The 600-Ton Blast Furnace of the Pittsburgh Crucible Steel Company, erected by the Riter-Conley Company

British Woodworking Machinery

THE works of The Mechanical Engineering Co. (Manchester), Ltd., have been in existence forty years engaged solely in manufacturing woodworking machinery, a guarantee that its products possess all modern improvements in design, detail and finish, which expert knowledge only can give to them.

There are many woodworking machines lacking the finer and most important points which would not pass the test of the wood-working engineer. To give an instance of what they mean, attention is invited to their 'TOLEDOV' and 'TRITON' surface planers. These machines will plane a glue joint which is an exceedingly important point to cabinet makers and builders.



smaller in diameter than the fast and revolves on a separate fixed sleeve without coming in contact with the saw spindle. The advantage of this is that the saw will not unexpectedly revolve, thereby eliminating the risk of accidents to operators. These machines possess other advantages, all of which lift them into the highest class.

This company makes two sizes of spindle moulders, the "EUREKA" with table 30-in. square and the "DIPLOMA" with table 36-in. square. Both these machines are of the reversing type through their countershafts. The quality of each machine is shown in the fact that any standard machine will, without special preparation, stand up satisfactorily to a speed of 6,000 to 7,000 revolutions per minute. The normal speed is about 4,000 revolutions per

minute. Of necessity, these machines require special attention as regards lubrication and great attention has been given to this point. Another important feature, due to the extremely high speed, is to have a perfectly balanced spindle. This also has had most careful attention.

No matter what machine is required, the makers claim that the selection can safely be left to them to supply the very best of its kind made in British works. They have endeavored to eliminate all complicated mechanism as far as possible, so that the operator of less than average capability can work the machines satisfactorily. *Lubrication* of every detail in all machines has had a thorough investigation and can be taken as the last word in what has been and is the greatest cause of trouble in machinery.

A brief list of the machines manufactured by this company is given below:—

Saw Benches.—Plain, with rise and fall tables. Pendulum crosscut. Horizontal crosscut roller feed. Rope drag feed.

Surface Planers.—Medium weight and heavy.

Spindle Moulders.—Medium weight and heavy.

Band Sawing Machines.—All sizes of wheels.

Combined Hand and Power Feed Planing and Thicknessing Machines.—15-in. to 24-in.

Panel Planing and Thicknessing Machines.—17-in. to 27-in.

Band Papering Machines.—Disc, bobbin, belt, drum.

Tenoning Machines.—One size.

Mortising Machines.—Hand and power.

Fret Sawing Machines.—One size.

Grinding Machine for knives and saws, etc.

The Mechanical Engineering Company, Ltd., are desirous of appointing agents in Far Eastern countries.

Their "IMPROVED" and "RELIANT" saw benches are two more examples of machines that embody the best design, workmanship, and material. The saw spindles revolve in ball bearings provided with the most efficient type of lubrication. The loose pulley is

Safes Roasted to Test Their Resistance

FIVE hundred salesmen, their eyes focused on one point, gaze with eager interest and suppressed excitement as a white hot steel safe, weighing half a ton, is drawn from a roaring inferno of fire and quickly swung three stories in the air, says the *Popular Science Monthly*. They hold their breaths during the short interval in which the crane man gathers his strength for a powerful jerk at the release rope. Dropping like a fiery meteor with a trail of scintillating sparks, the safe turns over slightly in its flight and crashes, corner first on a pile of broken bricks. Two laborers rush in with a streaming hose and play it on the mass of hot steel, enveloping it in a haze of hissing vapor.

Soon the clouds of steam thin and operators equipped with asbestos gloves approach the safe and open the door. The theoretical conflagration is over and the safe, after subjection to a heat seldom attained in ordinary fires, combined with a fall such as might conceivably take place when floors collapse during the height of a devastating fire, is seen to be still intact, with its contents of inflammable paper showing no signs of the fire it has been through.

A Special Laboratory

Such is the spectacular demonstration staged periodically for visiting salesmen and executives by a progressive manufacturer of a fire resistive safe. So valuable have these tests become that a special laboratory has been built in Marietta, Ohio, where new models of safes are subjected to similar rigid experiments. Equipment has been added by purchase or by invention that will simulate every known condition that safes must withstand in actual conflagrations.

It was a Methodist minister who, some 14 years ago, conceived the idea that a safe might be constructed that would be not only lighter in weight and greater in capacity than the old style iron safes then commonly in use, but also absolutely proof against destruction by fire. This man realized, as many others never have, that the contents of a building are not included when the term "fireproof" is applied to a structure. For while fabricating materials such as concrete and steel, with which a building is erected may be proof against fire, the furnishings and equipment of buildings are usually of the most inflammable nature.

Parson's Ideal Successful

After wide research and experimentation the Methodist minister completed a safe that under test proved to be all that he hoped. But though convinced himself, he found that salesmen and prospective purchasers still retained a measure of doubt that those light weight safes could do all that he claimed. So the testing laboratory and the spectacular tests were called into existence.

Previously safes had been tested by placing them in wooden huts and igniting the huts, but such tests were not exact imitations of conditions encountered in real fires. Test conditions could never be duplicated; results varied with the wind, and there was no way of surrounding the safe with burning gases.

Details of the Test

The most important apparatus at the present testing laboratory is a huge oven that can be heated to temperatures as high as 2,000 degrees F. by burners supplied with a special grade of high temperature gas delivered through a six-inch main. Air blowers supply the air for proper combustion of the gas.

After the safe to be tested is stuffed with books and loose papers, in simulation of the customary office safe, several sensitive thermometers, called "thermocouples," are placed at selected locations inside the safe and outside in the oven. The safe is then locked, oven door closed, and the burners are lighted.

At the end of five minutes the thermocouples register a temperature of 1,100 degrees; five minutes more and the heat increased to 1,400 degrees; at the end of thirty minutes the heat within the oven stands at 1,650 degrees; and finally, after two hours a top temperature of 1,950 degrees is recorded.

Through mica peepholes in the oven side, the safe appears as a mass of flaming red steel with burning gas enveloping it from top to bottom. In a near-by room observers watch the thermocouple readings and maintain the heat at the predetermined temperature by signaling the oven operators through a system of colored lights.

Drops with a Crash

After the completion of the heat tests, the safe is withdrawn the oven. A crane hooks it, then lifts it 40 feet in the air, it is released and dropped on a pile of broken bricks. Following this crashing fall, the safe is returned to the oven for a second period under high temperatures. This reheating is supposed to imitate the roasting undergone by the safe after it has fallen through a collapsed floor into a mass of burning debris. After an hour the safe is again withdrawn from the oven and cooled by streams of water.

Not all the safes are tested in the presence of thrilled audiences. The staff at the laboratory is constantly at work on routine tests, the results of which will tend to improve the quality of the product. Every 60 days a number of safes of all sizes are taken at random from stock and subjected to the most strenuous tests.

Selecting the Limit

The rating is based on an arbitrary standard selected after an experiment conducted by M. L. Carr, director of the laboratory. Under his supervision, sheaves of printed amongst clients who discovered a paper were placed in an oven and slowly roasted. As the temperature increased, the condition of the paper was noted through the glass front of the oven. At 500 degrees the paper had charred to a point where the writing and printing were illegible. Three hundred degrees was, therefore, selected as the limiting temperature that should be permitted in a safe.

U.S.A. National Automobile Show

THE annual national shows will be held at the Grand Central Palace, January 6 to 13 and at the Coliseum and First Regiment Armory at Chicago, January 27 to February 3. These exhibitions present the products of manufacturers whose stability is indicated by membership in the national automobile chamber of commerce or motor and accessory manufacturers' association or who have been producing at least one year.

At New York there will be approximately ninety exhibits of cars and between three and four hundred exhibits of accessories. At Chicago the number of cars will be the same, but due to lack of space the exhibits of accessories will be approximately two hundred and fifty. As has been the case for several years the buildings will be unable to accommodate a great many applicants.

These exhibitions are attended not only by dealers from the United States and Canada, but from practically all of the South American countries, most of the European countries and from as far away as Australia and New Zealand. The foreign departments of the manufacturers are always adequately represented and an opportunity is furnished the visitor to talk, not only with the business departments but with the heads of the mechanical, sales, export and service departments.

The management cordially invites visitors from abroad and will gladly furnish the necessary credentials on application.

Elesco Superheaters

EXPERIENCE in the design and manufacture of steam superheaters has indicated a number of essential points connected with their design, construction and operation. These have formed the basic specification for the Elesco superheater, and may be summarized as follows:—

1. Safety in operation.
2. Accessibility for inspection and repairs.
3. Protection against overheating, insuring maximum life.
4. Maximum superheating efficiency.
5. Improved efficiency of the combined boiler and superheater.
6. Use of high steam velocities in order to maintain clean interior surfaces and maximum heat transfer with minimum drop in steam pressure.
7. Uniformity of superheating, and ease of regulation.
8. Provision for expansion and contraction of all parts.
9. Provision for keeping units clean.
10. Minimum possibility for leaks.
11. Flexibility in adaptation to different designs of boilers.
12. Uniform distribution of the steam through all units under all condition of load positively preventing any by-passing of the steam.

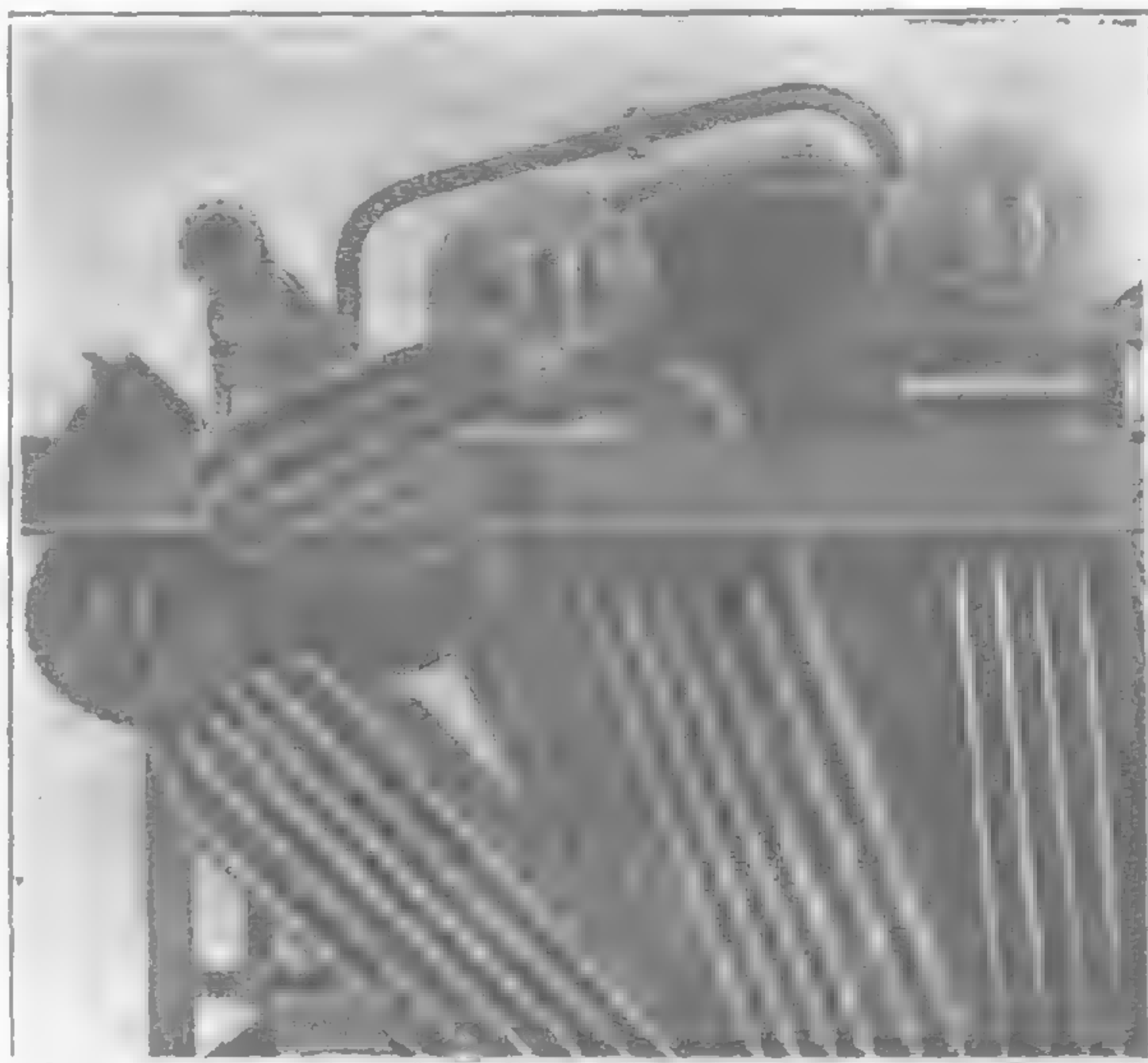


Fig. A. Typical Arrangement of Elesco Superheater

Headers

The headers are made of open hearth steel and are usually located outside of the hot gas path, and in the majority of the designs, outside of the boiler setting proper, so that the headers, as well as unit joints, are accessible for inspection and repairs without entering the boiler setting. The advantage of such an arrangement, particularly under present conditions of labor and supervision, will be readily appreciated. Safety valves conforming to the A.S.M.E. Boiler code are provided and are located near the outlet. Provision is also made for drainage. Superheated steam headers are provided with thermometer wells.

The headers are made with the outlet on the superheated header in an opposite location to the inlet on the saturated header, assuring an even distribution of the steam flow through all units.

Each header is reinforced along its length with a steel bar milled on one side to fit the interior wall of the header. This detail is shown in Fig. 1. This bar adds the necessary material to provide a sufficient grip for the studs and is drilled along its length at points registering with holes in the header, forming the steam passages between units and header.



Fig. 2. Elesco Superheater for Horizontal Water-tube Boiler

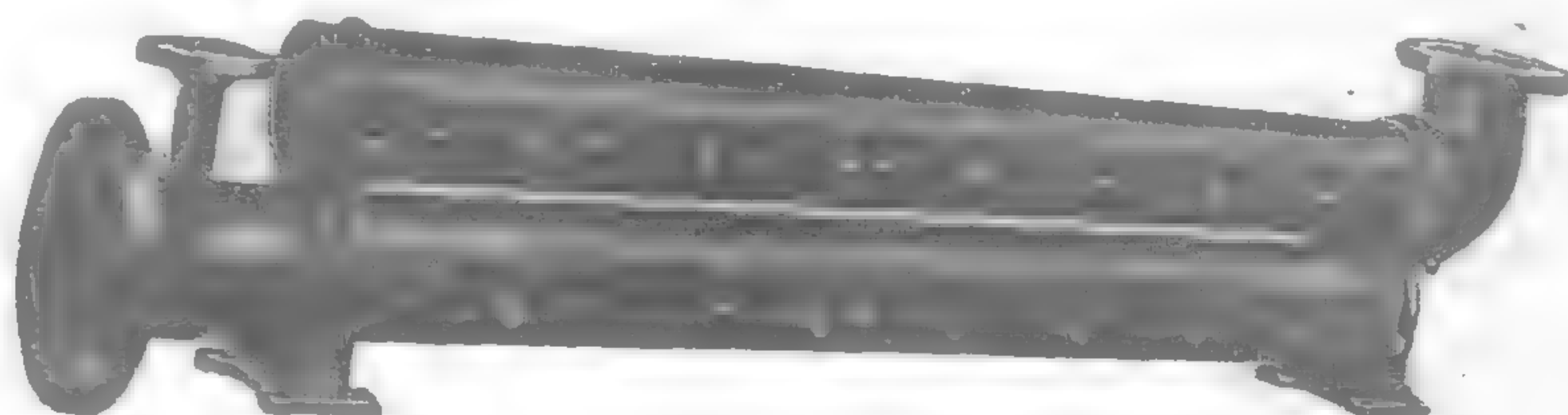


Fig. 3. Elesco Superheater Headers ready for Application of Units

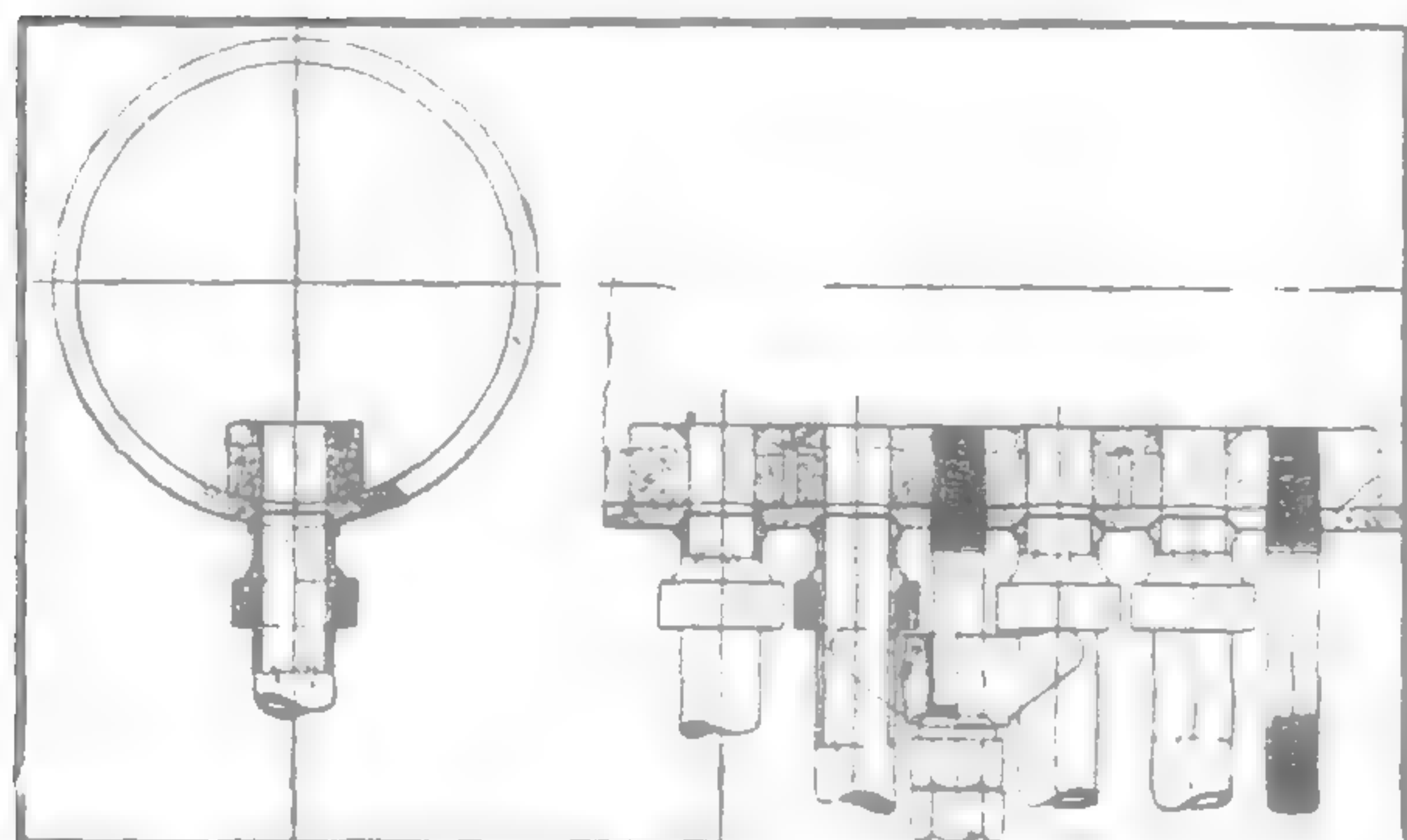


Fig. 1. Details of Ball Joint Construction Between Header and Units

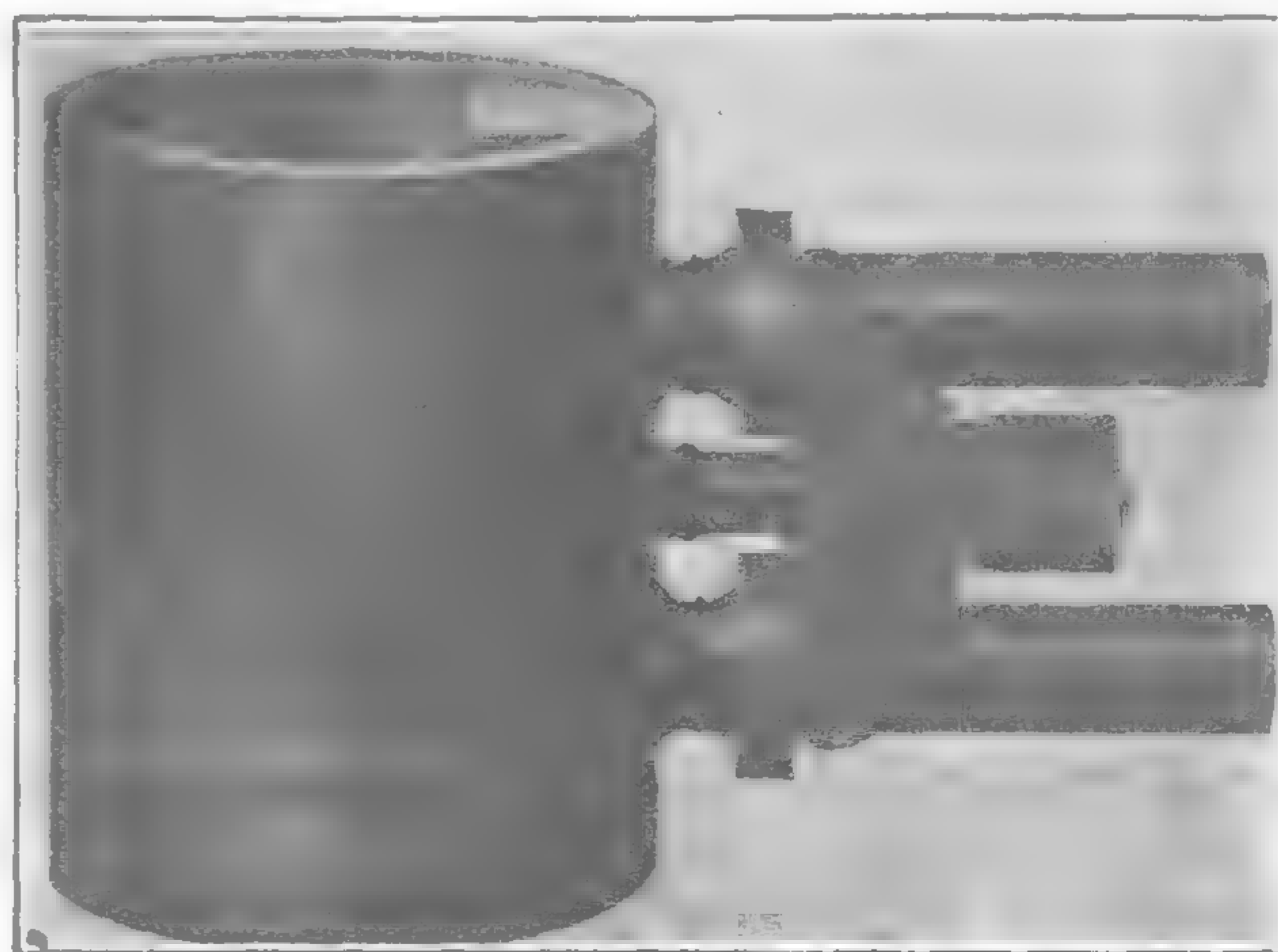


Fig. 4. Section of Header and Units Showing Ball Joint Construction

The superheater consists, in general, of two headers, one acting as the distributor for the saturated steam coming from the boiler and the other a collector header for the steam after it has been superheated, and the necessary connecting units in which the actual superheating takes place. A typical arrangement is shown (Fig. A).

Units

Units are made of heavy cold drawn, seamless steel tubing of the proper diameter to give correct steam areas. The tubing is not covered with any other material and it thus presents a

smooth external surface, offers minimum resistance to the flow of the gases and avoids serious collections of soot that would interfere with the efficiency and uniform operation of the superheater. This construction also brings the steam into intimate contact with the gas-touched heating surface, and gives a low resistance to the flow of heat from the gases to the steam.

The form of the unit is such as to permit free expansion and contraction of all parts. The tubes are bent on specially designed machines that do not weaken them or reduce the steam areas. Ample provision is made to prevent the pipes from warping. In cases where severe moisture and scale conditions are prevalent, the units can be made so that they may be satisfactorily cleaned on the inside. Due to the fact that the units are made of small diameter tubing, it is possible to obtain correct relations between steam areas and heating surface and so distribute the cross sectional area through the superheater as to obtain the most desirable steam velocity without the use of cores. The use of cores in superheater tubes causes a considerable drop in pressure through the superheater, because of the added frictional resistance of the steam and where bad water and foaming occurs, the small space between the cores and the inside of the tubes is quickly stopped by scale-forming material.

The connection between the units and headers is a metal to metal joint. This joint is made so as to permit the easy removal of the units without special tools, and its use also avoids two holes in the header which would be necessary with rolled joints. Any unit in the superheater can be disconnected without interference with the other units, and the work of disconnecting a unit, which consists merely of loosening a bolt, can be done by the ordinary power plant attendant. The ball end, as shown in Fig. 1, is formed integral with the tube by a special forging process. The ball is then faced and ground, and fits into a ground seat in the header, which is made at an angle of 45 degrees. The clamps and washers are made of forged steel, and the header bolts are made of heat-treated alloy steel, with an elastic limit of not less than 75,000-lbs. per square inch. This joint, while a new departure in stationary superheater design, has been used by this company in more than one million five hundred thousand superheater units and is the only metal to metal joint that has withstood the extremely hard service of locomotive operation under steam pressure of 200 to 225 pounds and total steam temperature of 650 to 750 deg. Fahrenheit.

Return Bend

In most designs of Elesco superheaters, the loops of the units are forged return bends. These return bends are made on the ends of the units from the metal of the pipe itself by a special mechanical forging process, without the use of electrical or acetylene

welding and without the addition of any material or metal. The distribution of the metal as will be seen in Fig. 5 is such that there is an increase in section at the end. The use of the forged return bend in the unit construction of the Elesco superheater results in a continuous pipe, the bend being as strong if not stronger than the body of the pipe. It also affords a sharp return without adding excessive pipe friction and facilitates the convenient and advantageous location of the superheater units.

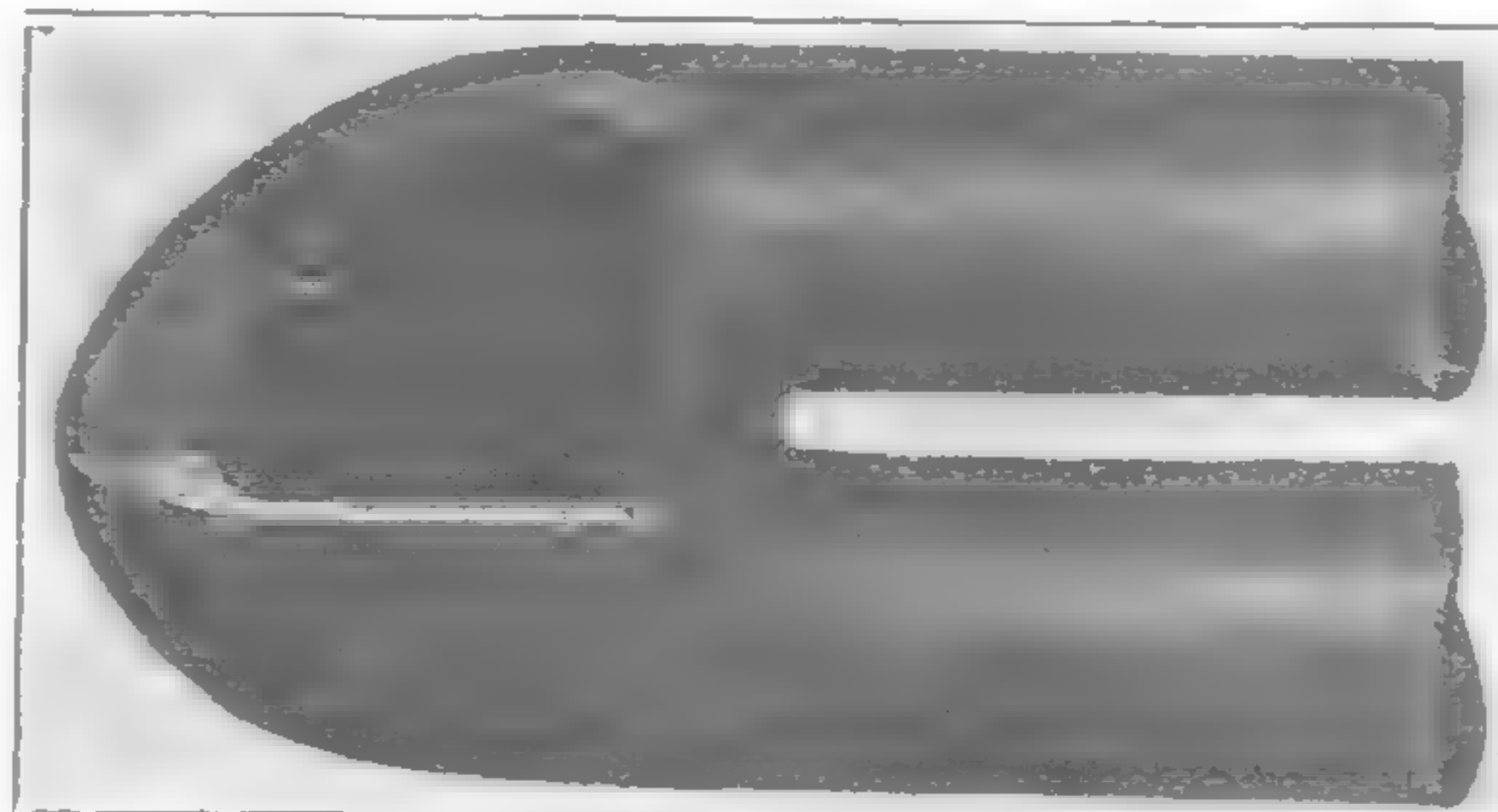


Fig. 5. Forged Return Bend

Location of the Superheater

The location of the superheater in all boilers is such that the headers and joints are accessible for inspection and repairs, and so that any unit can be easily withdrawn. In all cases the superheater is entirely separate from the boiler proper, being located in a component part of the boiler setting through which the products of combustion pass, in such a manner that the addition of the superheater in-

creases the over-all efficiency of the boiler by lowering the final flue gas temperature for any given set of furnace conditions. The superheater header is suitably protected from the direct action of the hot gases. Headers and units are securely supported and are independent of the brick work wherever this is possible. No additional care of the boiler is necessary on account of the installation of the superheater, and the design and construction are such as to make the cost of maintenance and operation negligible.

With the ball joint construction, hand holes and gaskets for unit joints are entirely eliminated and the number of joints to be maintained is approximately one-fourth of the number required where rolled joints, including the necessary hand holes, are used.

In case boiler repairs may be necessary, units can be removed and replaced without distorting units or headers and without the destruction of metal in any way. Units can be readily detached, removed or replaced without the need of a

boiler maker, it being necessary to remove but two nuts to loosen two units.

High steam velocity is used in Elesco superheaters, a feature which tends to maintain clean surfaces on the inside of the units.

Units can be blocked off when necessary simply by relieving the pressure on the boiler and applying a dummy coupling to the unit connections.

Summary of Advantages

Elesco superheaters are suitable for application to all types of boilers. They provide maximum superheating efficiency and capacity and maximum combined efficiency of the boiler and superheater, as well as uniformity of superheating effect. Their design and construction is such as to provide freedom from leaks, ease of application and accessibility for inspection and repairs, and maximum length of service without renewal.

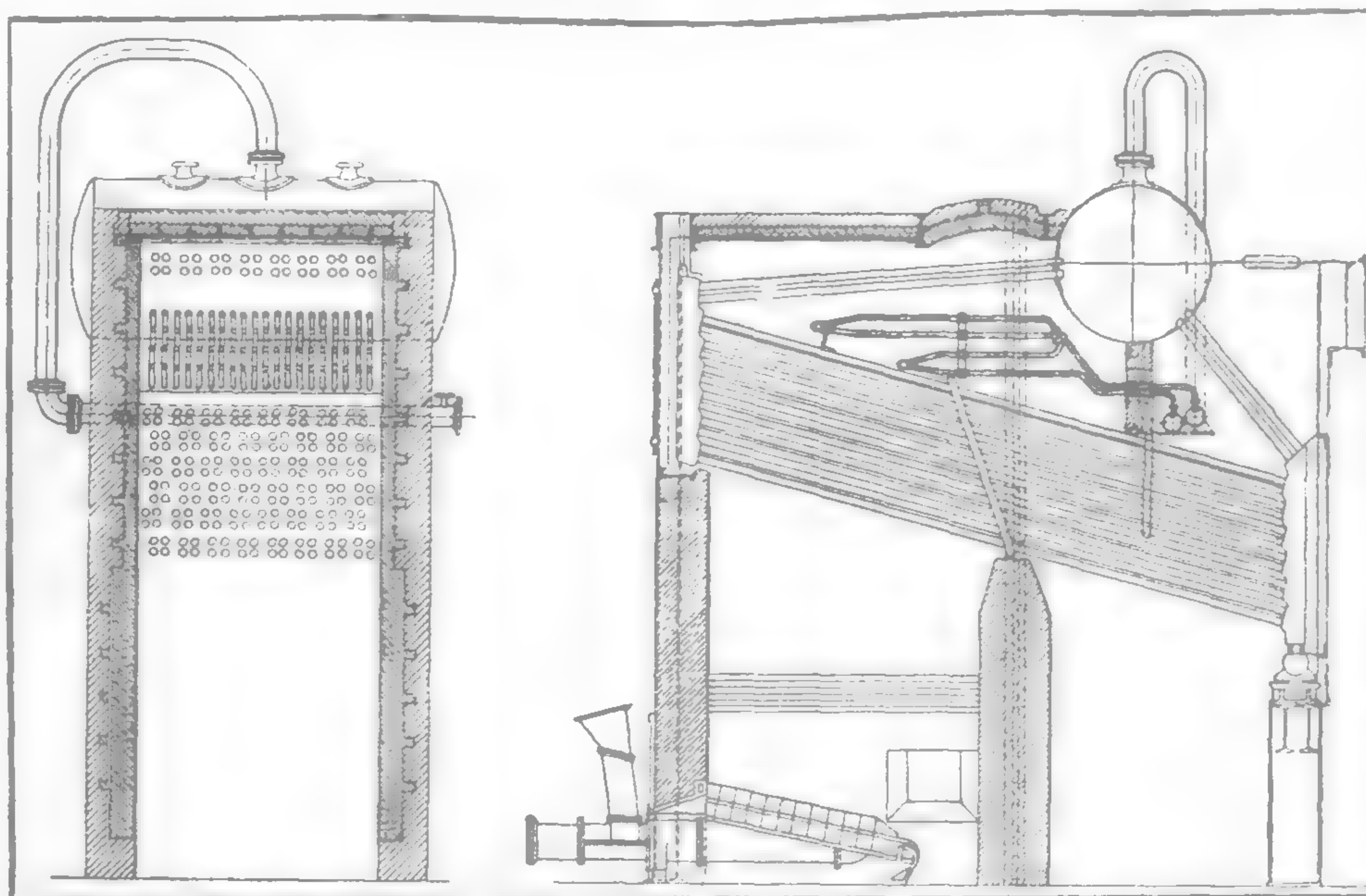


Fig. 6. Elesco Superheater, as Applied to a Springfield Cross-drum Horizontal Water-tube Boiler

Superheated steam will accomplish more in power plant fuel economy than any other single factor; the higher the superheat the greater being the economy. The superheaters manufactured by this company, because of the correctness of the principles employed in their design and construction, provide the maximum superheat obtainable. They are, therefore, particularly suitable for modern power plants where the greatest economy, capacity and efficiency are essential. At the same time, their construction is such that they can be built to deliver any amount of superheat required, in cases where the maximum is not desired. They are applicable to all boilers of either the fire tube or water tube type, vertical or horizontal, and they embody the results of the long experience of this company as designers and builders of steam super-heaters for all classes of service.

will adhere securely to same. In fact, Everseal can be laid during a heavy rain with equal facility and positive results.

A few other uses of Everseal plastic roofing are for joining and setting glass in greenhouses, for caulking boats, lining the entire gutters, flashing the brick or side of a wall and for laying tile or slate.

Consider the economies that can be effected with this truly wonderful waterproofing compound, a product adapted to waterproof anything anywhere.

At last, Everseal plastic roofing has answered that every great demand for a product that will do all kinds of waterproofing.

Safety Devices for Oerlikon Steam Turbines

THE trustworthiness of the steam turbine is established, but it is now customary to make assurance doubly sure by fitting it with various devices which experience has shown to be desirable. Particular attention has been paid to the design of these devices by the Oerlikon Company, of Switzerland, and in this article we are enabled to describe their construction and working.

If acid vapours enter the boiler and turbine house, or, if as a consequence of leaky joints sea-water obtains admission to the condensate, serious corrosion troubles may arise in the turbine. In order to counteract such tendencies, the Oerlikon Company has paid great attention to the thorough drainage of the turbine, both when running and when at a standstill. Fig. 1 illustrates diagrammatically the drainage system adopted. In order to prevent any water from the boiler entering the turbine, a large water separator U is fitted into the steam pipe immediately in front of the main valve A. The steam exit of the separator is divided with a strainer, the butt end and lower portion of which are not perforated. The steam is, therefore, forced to change its direction, and the heavy drops of water are made to fall downwards. The water thus ejected is led away from the separator through the steam trap V. The trap is provided with a ball float, which opens a valve below it when the water has accumulated to a certain degree. A valve W is provided in the pipe in front of the trap and leads the steam into the trap or alternatively into the open. The trap can, therefore, be inspected during ordinary running hours without interfering with the working of the separator. To the open conduit leading from the valve W a second trap can be connected if desired.

Nearly all turbines are nowadays operated by superheated steam, so that after the machine is in regular operation no water will be deposited in the main steam pipe. From the low-pressure end of the turbine the condensed water escapes freely as a consequence of the constantly increasing diameter of the stages. Circumstances are similar at the high-pressure end, although the drainage here is less free in view of the fact that the increase in the diameter of the wheels from stage to stage is less rapid.

When the turbine is at a standstill, it is as important to secure perfect drainage as it is when it is running. A second valve X is provided in front of the main valve A, which is also closed when the turbine is shut down. The valve W is also turned into the open position. If, then, the steam pipe in front of the valve X be under pressure and this valve be leaky, the leakage steam will not pass through the valve A into the turbine, but through the valves Y and W into the open. In order to drain away the condensed steam from the turbine casing after shutting down, three drains Z are provided and are opened when the turbine is at a standstill.

Fig. 3 represents a longitudinal section of a large size Oerlikon steam turbine. The rotor is carried in two bearings, one of which is designed to take the thrust. The lubrication system is of the forced pressure type. After leaving the bearings, the lubricating oil is directed into a cooler. The generator is driven through the intermediary of a semi-rigid coupling. The runner wheels are

Food for Thought on the Question of Waterproofing

“WATERPROOFING”—millions of dollars are wasted annually on construction through inadequate waterproofing. Metal rusts, brick crumbles, and wood deteriorates when not sufficiently protected by a coating to prevent water or dampness from forcing itself through. In fact, there is always present the danger that the building itself may crumble due to the weakened condition of the supports brought on by water damage. Did you ever stop to realize this? Take for instance a roof of your building. If there is water coming through any spot, it isn't the annoyance of the drops of water coming through the building, it's the walls and ceilings that are ruined, not mentioning the merchandise that may be stored underneath the roof. This loss is far greater than the actual cost of the roof, in excess of the sum that it would have cost to make same waterproof with the product manufactured by the Everseal Manufacturing Company, 41 Union Square, New York, called “Everseal Plastic Roofing.”

Everseal plastic roofing is the most durable water-proofing compound, because it will not chip, crack, bulge or break loose. Most serviceable, because old roofs of any description be recovered at a very small expense. This product comes ready for use and requires no melting, heating or mixing. Everseal plastic roofing sets over the entire roof like a solid coat of rubber, expanding and contracting with the surface it covers. It is very easily applied with a mason's trowel, directly over the old roof which can be used as a base, and eliminates the disadvantage of laps and seams.

Everseal plastic roofing will renew the worst weather beaten surface and maintain its life at a surprisingly low cost. The first cost is the only cost as the surface will never require painting or patching which are a great expense and at best give but temporary service. A comparison of prices will reveal that Everseal plastic roofing will save the property owner from 40 to 60 per cent. as compared with the laying of a new roof.

The initial cost of a tin, iron, steel, shingle, slate, gravel or composition roof is far greater than the initial cost of Everseal plastic roofing. The expense on these other roofs now start as the surface of tin, etc., must be preserved with an outside paint which in time costs a good deal more than the initial price paid for the roof, whereas the cost of Everseal plastic roofing ceases as soon as it is applied to the surface.

The uses of Everseal plastic roofing does not stop after waterproofing the roof. It has always been adopted to waterproof cellars, foundations, walls, cisterns, tanks, silos, or in fact any leak anywhere. Everseal plastic roofing is a combination of natural gums and long asbestos fibre which when applied to the surface will hermetically seal same, preventing any possibility of water or dampness seeping through.

The remarkable feature of Everseal plastic roofing is that no matter how damp or moist the surface is, Everseal

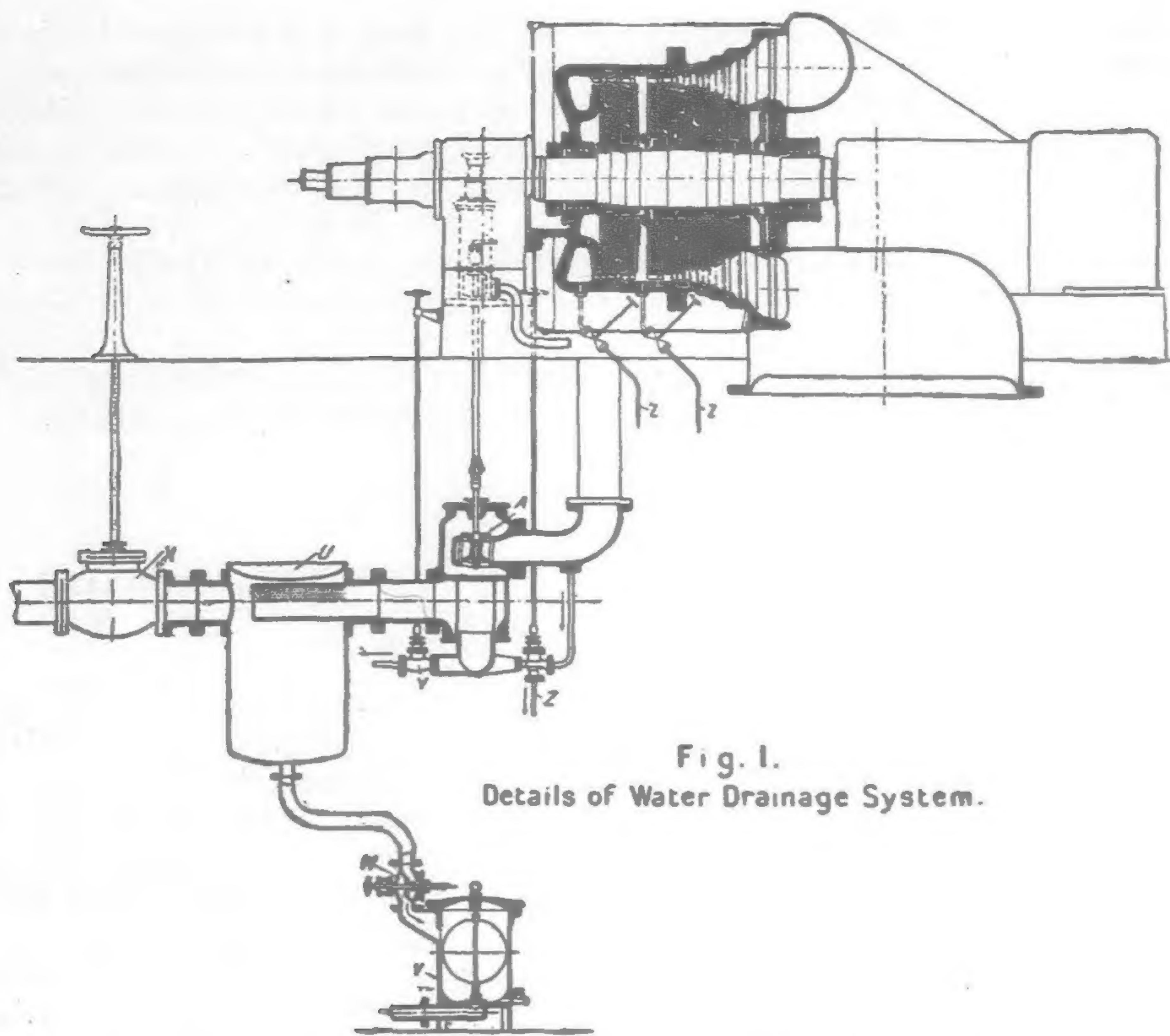


Fig. 1.
Details of Water Drainage System.

designed as discs of equal sectional strength. The clearances between the casing and the unner wheels and between the runner wheels and the diaphragms are liberal, amounting to from $\frac{1}{8}$ to $\frac{1}{4}$ -in.

Fig. 2 illustrates the governing device. The live steam passes through the main valve A to the regulating valve B. The latter is governed by oil under pressure delivered from a power cylinder or servo-motor, the action of which is controlled by a spring governor. The admission of steam into the turbine is regulated by throttling it in accordance with the load. If the full admission pressure be reached, and the load increases still further, the overload valve C is opened automatically, and admits an additional supply of live steam whereby the guaranteed overload is obtained.

The oil under pressure for the bearings, as well as for the governing system, is supplied by a "toothed" oil pump D, directly coupled to the governor spindle E and therefore running at relatively low speed. It is claimed that this type of pump is particularly reliable. The oil on leaving the bearings and the governing system, passes first through the base plate F and then runs through a strainer G.—which can be changed whilst the turbine is in service—into the collar H. Although all precautions are taken, it is possible that by coincidence, or as a consequence of improper manipulation, the action of the oil pump may fail, as, for instance, by the packing in the conduits being damaged. To guard against the effects of such an accident, the Oerlikon turbine is fitted with a safety device designed to become operative upon a failure of the oil supply. The main valve A is closed by the action of the spring J, and is opened by the oil admitted beneath the piston K under a pressure of approximately 60-lb. per square inch. The strength of the spring J is such that the main valve is totally closed as soon as the oil pressure drops to 22-lb. If, then, the oil pressure should fail for one reason or another, the admission of steam is stopped before the bearings are endangered.

If desired the Oerlikon Company supplies a signalling device, which draws the attention of the attendant to any adverse condition of the oil supply. If the set is designed to work in parallel with other machines on the same supply system, an automatic electric switching-off device can be supplied. The spring J keeps the main valve in the closed position, with a force of about half a ton. To shut down the turbine the three-way cock L is turned round through 90 deg. The oil then flows away from beneath the piston

K, into the base plate F, and allows the spring to close the valve.

As is now generally customary, the Oerlikon turbine is provided with a safety device to guard against over-running. The governor M is mounted on a shaft E, driven by worm gearing N from the turbine shaft. Although the regulating valve B is moved by oil under a fairly high pressure, the governor is called upon only to operate the small controlling piston P. Even if the wear in the gearing N became such as to bring the governor shaft E to a standstill, and so cause the governor to lose all control over the machine, the turbine would not "run away." The oil pump D being coupled to the governor shaft, would stop with it, and as consequence of the resultant dropping of the oil pressure the turbine would be shut down by the action of the spring J, as explained above. In order, however, to prevent under all circumstances an excess speed being reached, the Oerlikon Company provides in addition a powerful emergency governor Q—see Fig. 3—fitted to the end of the turbine shaft. This emergency governor instantly shuts off the steam supply when the speed of the turbine exceeds the normal by approximately 15 per cent. Its action results in the oil control piston R being operated in such a manner that the pressure of the oil is transferred from the under to the upper side of the main valve piston K. The main valve is thus closed by a force of approximately one ton, due to the

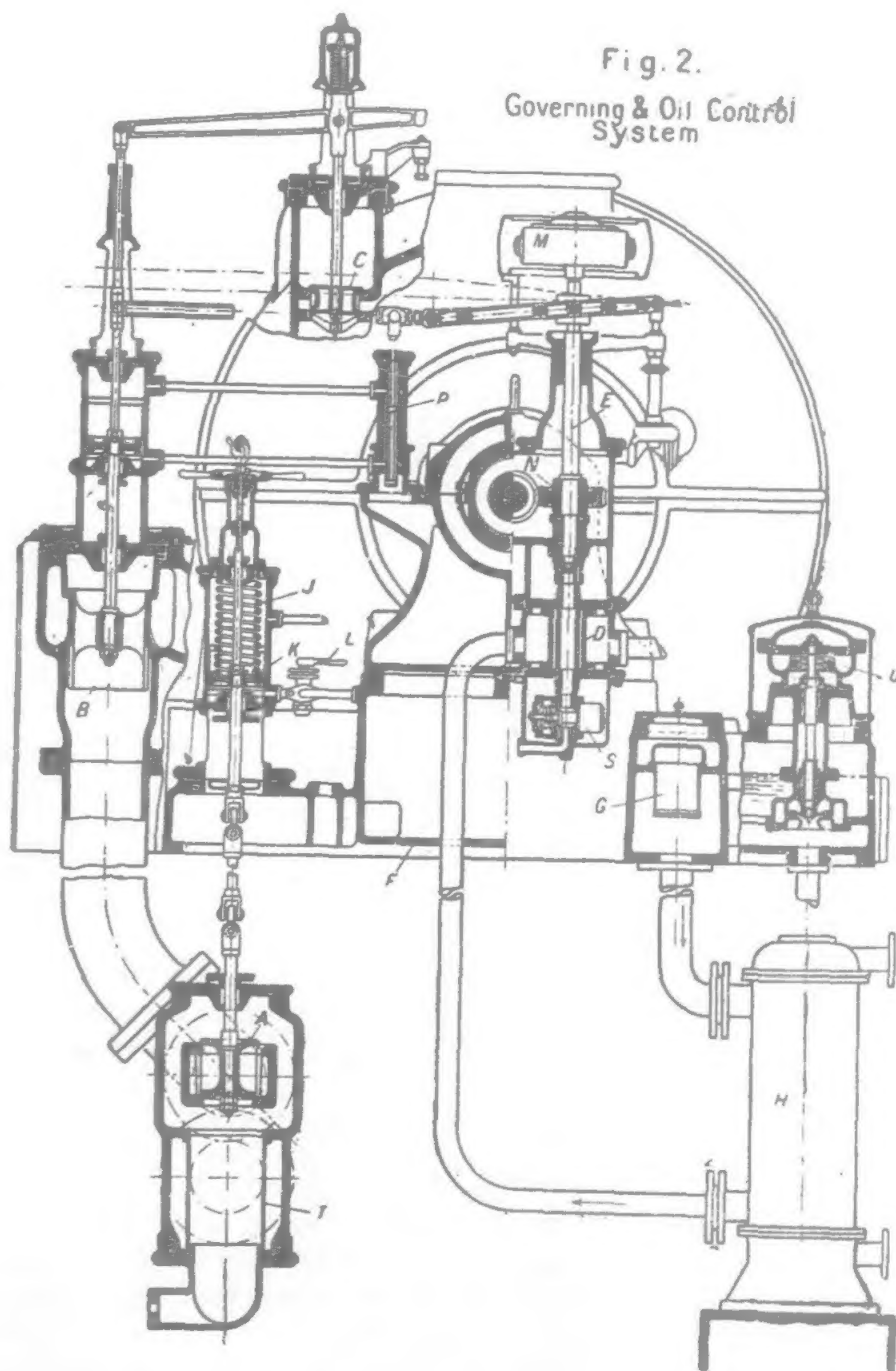
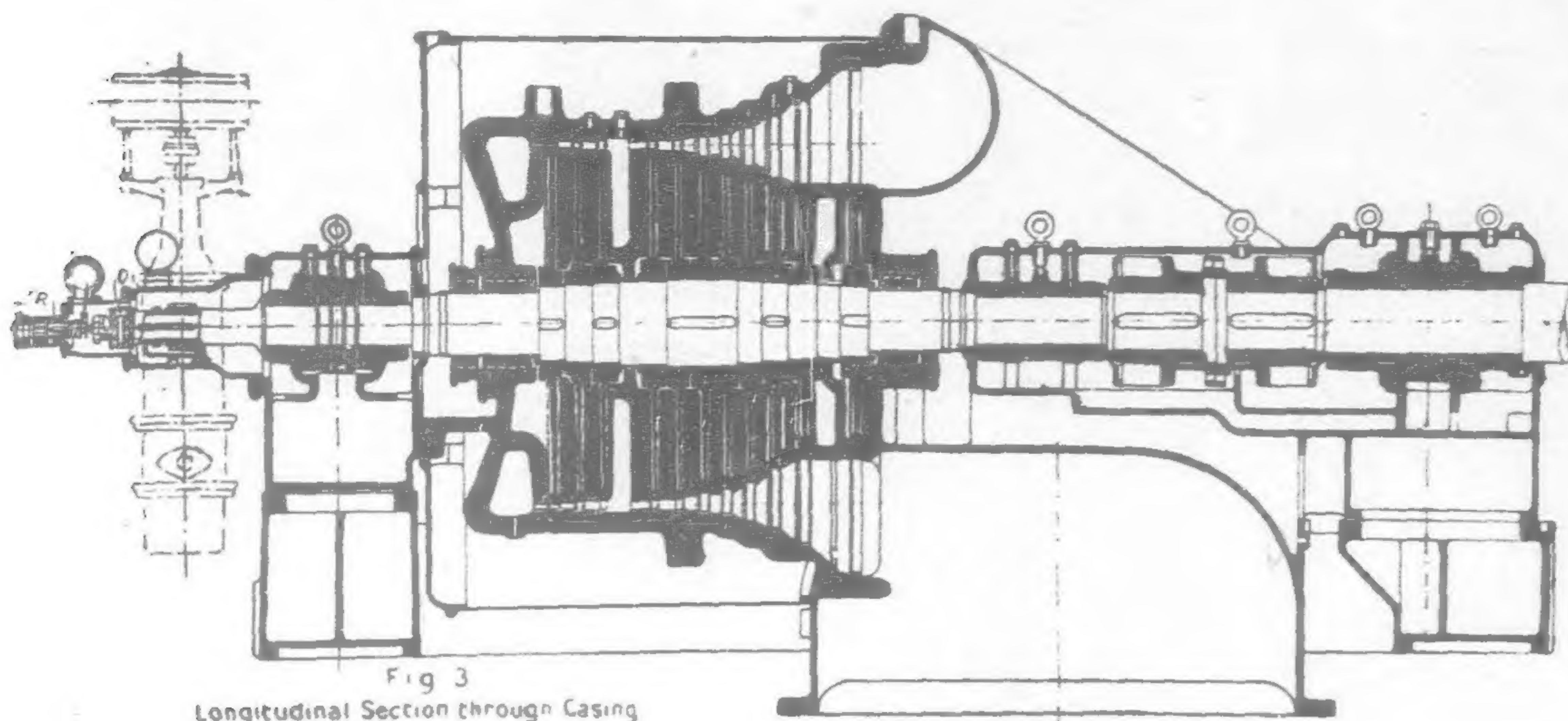


Fig. 2.
Governing & Oil Control System



oil pressure, supplemented by a force of half a ton due to the spring. It is thus hardly possible for an accident to happen by reason of the governing forces being too small to close the main valve. As an additional emergency governor the device S—Fig. 2—is mounted on the governor shaft. This operates the main valve should an excess speed of approximately 20 per cent. be reached. Although all precautions are thus taken to prevent the turbine reaching a speed materially greater than the normal, the materials used, we understand, are such and are so proportioned that it could run at about 80 per cent. above the normal speed without damage resulting to any part.

In the case of turbines used for driving generators of large output capacity and high speed, the emergency governor Q is arranged in such a way, that the same will already come into operation at the normal speed. The position of this governor is indicated by a special Tachometer—See Fig. 3. Nevertheless the steam admission is only cut off if the speed exceeds the normal by about 15 per cent. as stated above. With this arrangement it is an easy matter for the driver to check at any time the readiness of the emergency governor to operate.

A new safety device has recently been provided on Oerlikon turbines which, it is stated, has not yet been applied in connection with other turbine systems. This device protects the machine against the consequences of axial motion of the turbine rotor. It is well known that if the boilers are not properly fed, or if the load varies frequently and widely, water may pass over from the boilers into the turbine. This may give rise to water hammer, which in turn may result in the generation of enormous axial pressures on the rotor and on the thrust bearing. The axial pressure from this cause has been known to destroy the thrust bearing. If destruction occurs the rotor would be pressed by the steam towards the low-pressure end, until the runner wheels came into contact with the diaphragms. Obviously at the high speed at which the turbine runs, serious damage both to the runner and guide wheels would be caused by this action, and would result in the machine being put out of commission for some considerable time. Such an accident could also occur if for some reason the admission of oil to the thrust bearings were stopped. In order to safeguard the turbine against damage of this nature, the Oerlikon turbine is provided with a device which instantly closes the main steam valve on the rotor shifting axially by a small amount, say 1.5 mm. $\approx \frac{1}{16}$ in. With the provision of this device, the most serious damage to be expected is a certain amount of side wear on the thrust bearing.

In front of the main steam valve A a strainer T is fixed so that foreign bodies cannot enter the turbine with the steam. The strainer can easily be removed and cleaned.

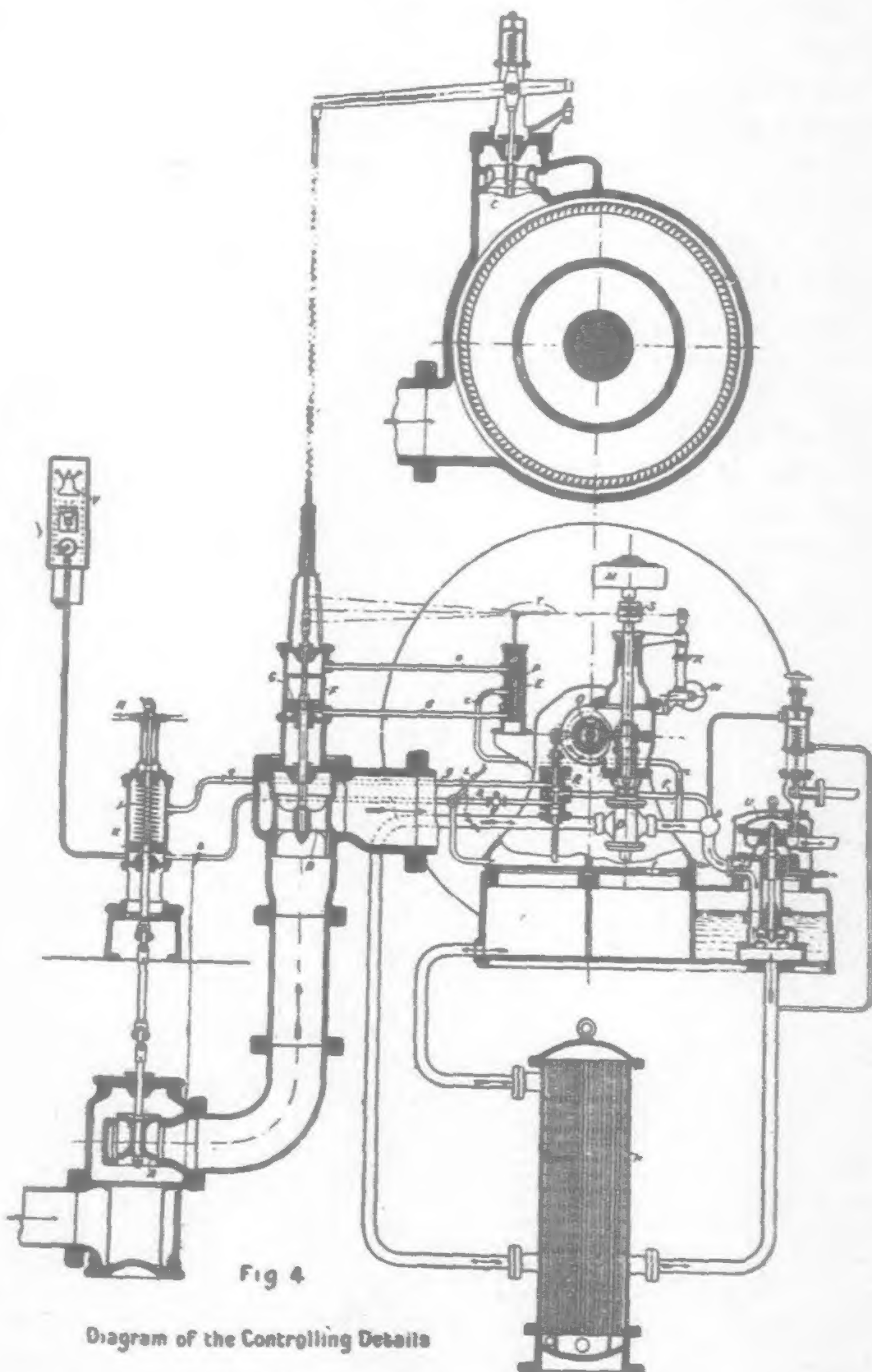
Turbines of large capacity are provided by the Oerlikon Company with a stand-by steam-driven oil pump U—Fig. 2.—which is brought into action when starting up the plant, and which is

also arranged to replace, in case of need, the gear oil pump D. Turbines of small capacity are, for reason of cost, made in a simpler form, but all Oerlikon turbines are provided with safety devices ensuring against accidents caused by excess speed, axial shifting of the rotor, and failure of the oil pressure. It is only in the case of auxiliary turbines operating condenser machinery and of very small turbines that the device ensuring safety in the event of a failure in the oil pressure is not regularly supplied, though this can also be provided in such cases if required.

Governor and Governing Diagram

The manner in which the Oerlikon turbine fitted with the safety devices herein described is started up and closed down may now be dealt with in detail. In Fig. 4 are given two diagrammatic sectional views through the turbine, taken as regards the lower, through the bearing pedestal, at the high-pressure end, and as regards the upper, through the high-pressure steam inlet passage immediately in front of the first nozzles. All the valves are shown in the positions occupied when the machine is at standstill.

Before starting up the turbine, the attendant sees that the steam inlet valve A and the three-way cock L on the oil supply



pipe A are closed. The circulation of the oil to the bearings and controlling parts of the turbine is started by means of the auxiliary steam pump U. The supply of oil is drawn from the cooler H and is forced through the pipe B to the bearings of the turbine and generator. Simultaneously, the oil is led through the pipe C to the controlling cylinder E and thence through the pipe D to the regulating cylinder F. The piston G is thus pressed upwards, so that the regulating valve B and the overload valve C are opened fully.

In order to warm up the turbine the main valve A is now very gradually opened by turning the hand wheel N just sufficiently to allow enough steam for the purpose to pass into the turbine. This flow of steam is continued for about ten to fifteen minutes, until the exhaust feels warm to the hand. The turbine may then be started up by opening the valve. A further by means of the hand wheel until the rotor begins to move. The machine can now be brought up to full speed by still further opening the valve A. The governor M is then brought into action and takes over the speed-control of the turbine.

The governor sleeve S on rising operates, by means of the levers T, the piston P of the controlling cylinder E, and the oil passes through the tube E into the regulating cylinder F above the piston G, while the oil beneath this piston flows away through the tube D. The controlling piston P is now brought back by means of the levers T into its intermediate position.

In the meantime the main oil pump D has gradually come into operation during the starting up of the turbine. The pressure of the oil is maintained at approximately 60-lb. per square inch, a pressure which when reached is sufficient automatically to shut down the auxiliary pump U. (The automatic control of the stand-by steam-driven oil pump is only provided with units of large capacity.) As soon as the machine has reached full speed, the three-way cock L must be opened. The non-return valve V in the tube A is pierced with a small hole in such a manner that the oil can pass through it only very slowly; this fact prevents the main stop valve from being opened too quickly.

When the turbine is working idle, the overload valve C is totally closed, and the regulating valve B is open to the extent required for no-load conditions. The machine can now be paralleled with the bus-bars by means of the speed adjustment device. The speed can be adjusted either by means of the small electric motor W and its push button switch from the switchboard, or by means of the hand wheel X. In case of overload the valve C is partially opened, so that live steam is admitted to a stage near the centre of the turbine.

When the machine is being switched off from the bus-bars, the speed rises. The governor M coming into operation closes the valve B, to such an extent that only sufficient steam is admitted to meet the requirements of no-load running. Should, for one reason another, such as the jamming of the regulating valve B or of the piston G or of the governor M, the machine start to race when disconnected from the bus-bars, then the emergency governor "on the end of the turbine shaft comes into operation at a speed corresponding to the normal plus from 10 to 15 per cent. The controlling piston R then changes its position, so that the oil may pass from the tube F into the tube G. The valve A is then closed by the oil pressure above the piston K, and the force exerted by the spring J. The oil beneath the piston K flows through the tube A and the non-return valve V back into the oil chamber. In the ordinary way the shutting down of the machine is effected by turning the cock L into the "shut" position.

If, during the regular working of the turbine, the oil pressure sinks below about 28.5-lb. per square inch, the signalling device Y. is operated, and the driver's attention is drawn to the low oil pressure by a signal bell. The main valve A begins to close, and is closed wholly if the oil pressure sinks to or below 22-lb. The machine, however, runs on, and the bearings would quickly become hot from want of lubrication. It is for this reason that a signal bell warning arrangement has been adopted.

The signalling device consists of a pressure gauge with a sliding contact, adjustable between the limits 7 to 28.5-lb. per square inch, a relay and a bell and dry battery. The pressure gauge is connected to the regulating cylinder at a point under the piston K. Normally, the oil pressure is between 55-lb. to 70-lb." Electrical contact is only effected in the gauge at a pressure of 28.5 lb., at which pressure the circuit of the relay closes, thereby releasing the relay armature and closing the local circuit of the bell. As soon as the oil pressure falls below about 7-lb. the contact in the pressure gauge will be broken, but the bell circuit remains closed until the relay armature is replaced by hand in its original position.

Each time the turbine is started up, the signalling apparatus operates, so that a check on the apparatus being in good working order is thus afforded. As soon as the pressure exceeds 28.5-lb. the relay armature can be re-set and the bell silenced.

The auxiliary pump U can be supplied to start automatically, as soon as the oil pressure sinks below about 50-lb., as the spring will then lift the piston and thus open the valve of the auxiliary turbine driving this pump.

Missionaries to Use Radio and Airplanes

Radio phones and airplanes as aids in carrying on missionary work in virtually inaccessible parts of China will be used by missionaries of the Methodist Episcopal Church in Tzechow, West China. Plans were announced by the Rev. James Maxon Yard, and relayed to the committee in America by the Rev. Paul Hutchinson, editor of the *Chinese Advocate*.

The delegates at the missionary meeting could see the mountains of Tibet. It is several weeks journey from Shanghai and there are no railroads in that region. The Tzechow territory lies in the heart of China's wealthiest province, Szechuan, with 60,000,000 inhabitants. Because of the lack of transportation facilities and inaccessibility of some sections, missionaries have been unable to reach many of these localities.

The missionaries planning work for the next ten years, voted for four sets of wireless telephones with which to link up the widely separated main stations, and four two-passenger airplanes with which to reach hitherto inaccessible sections.

Fuller in China

Mr. Wilbur S. Sample, formerly manager of the Montreal, Canada, office of the George A. Fuller Co., Ltd., has recently left for Dairen, Manchuria (North China), to assume the duties of district manager of the George A. Fuller Co. of the Orient, Ltd., for that and other Chinese territory.

Mr. Sample will direct the construction of a general hospital for the South Manchurian Railway Company at Dairen, together with additional construction work which is to follow both in that section and in Shanghai, China.

Mr. William Oehrle is New York manager of the George A. Fuller Co. of the Orient, Ltd.

Merryweathers' Purchase

The old established and well-known business of Shand Mason & Co., fire engine makers of Blackfriars, has been purchased by and is now incorporated with Merryweathers' of Greenwich who have been represented in Hongkong and China by Jardine, Matheson & Co., Ltd., for the last 15 years. This is one of the most noteworthy combinations in the recent annals of engineering as the two firms concerned are household names and stand for all that is best in the science of fire fighting.